FLASHES AND PLUGS

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They found a drunken woman in bed with the telephone receiver off the hook.

She said she was all right but wondered if the officers would get her a glass of water. They did.

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But the store's management telephoned police to report that a thief had stolen a new suit in full view of the shopping crowd.

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Then, flirting further with the script, she added brightly: "It's for you dear. Long distance from Moscow." Under her breath she added "Get out of that one, Toots."

CIRCULATION

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Telephony

THE JOURNAL OF THE TELEPHONE INDUSTRY

August 7, 1954

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608 S. Dearborn St., Chicago (5), Ill., U. S. A.
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By *DONALD C. POWER**

Selling Time is Here Again

The need for intelligent sales effort in the telephone industry is becoming more and more apparent. It has a good product which more people can use . . . it has additional services to offer which many subscribers don't even know about . . . it has securities to sell to the investing public. A company, to progress, must sell hard.

A SHORT TIME ago one of my friends, Harold H. Young, who is generally recognized as one of the top utility analysts in the country, was questioned about the effect on utility earnings if there should be a decrease in the economy of the country. Mr. Young, in my opinion, made a very significant answer. Here's what he said: "In my humble opinion, the men running America's utility companies would not sit idly by and let revenues drop without doing something about it. I cannot escape the conclusion that, if the business started to drop seriously, the same aggressiveness and initiative that has been applied so successfully over the years to the upbuilding of the utility industry, would be directed to meeting the situation."

There has been a general tendency on the part of the public to regard utility companies as rather placid institutions—completely lacking in vigor and determination. I must confess that, in some cases, this impression of ineffectiveness is well founded. But, for the most part, our utility organizations have shown the same aggressiveness and imagination as that demonstrated by so-called "competitive" businesses. Recognition of our business methods has, I believe, been long overdue; that is why I was so pleased to hear so eminent a utility authority as Mr. Young speak forth so clearly.

Let's face it then. Perhaps this is going to be only the *second* best year in the history of American business, but this surely is not the worst fate that can befall us. However, all of us need to maintain at least the earnings we secured in 1953 if we are to attract the new capital necessary for our continued expansion and, I can tell you very candidly, in the case of General Telephone System, we would like to make rather substantial improvements in 1954.

The Independent telephone industry has more shareholders than ever before. We are faced with ever-increasing costs, because our business has not

*Mr. Power, who is president of General Telephone Corp., presented this address before the recent convention of the New York State Telephone Association.

yet caught up with the high prices brought about by the past inflationary spiral; this means we must re-price our product upward when many other services and products are falling in price.

It is not going to be easy and some may sit back and wonder just how we

KEY TELEPHONE SYSTEMS — For several lines on one telephone as well as for intercommunication. Most all businesses, whether large or small, can benefit from this type of station.

can reach the elementary, yet necessary, objectives when the odds seem to be "stacked" against us. Well, as a starting point, let's see what some other businesses are doing to meet these very same problems.

Let's take a look first at the automobile industry. Here we see one of the most intense efforts ever undertaken by any industry to maintain maximum production. And how do they propose to do it? They're going to sell. They're going to get their salesmen up out of their desk chairs and send them out to find customers. They are going to call on people and, if they are not successful the first time, they're going to call on them again, and keep on calling.

The electrical appliance industry is in the same position as the automobile industry. Both groups are selling hard, through advertising, through salesmen, through newspapers, through any way which will contribute to a sale. Their entire organizations have become sales-minded above all else; every employe who can possibly affect a sale—and others who can only contribute indirectly—have been told plainly and simply; "Look, our continued prosperity and your continued good pay can only last if our sales keep pace with capacity output upon which both our prosperity and your good salaries are based. We are not going to manufacture goods just for exercise and experience. We want to make our product to sell at a profit. We want your assistance, but, most of all, we want you to know the true story."

My friends, this is the time when we must sell—really sell—or many of the good things in our business lives and our personal lives as we are now enjoying them will come to a rather abrupt conclusion.

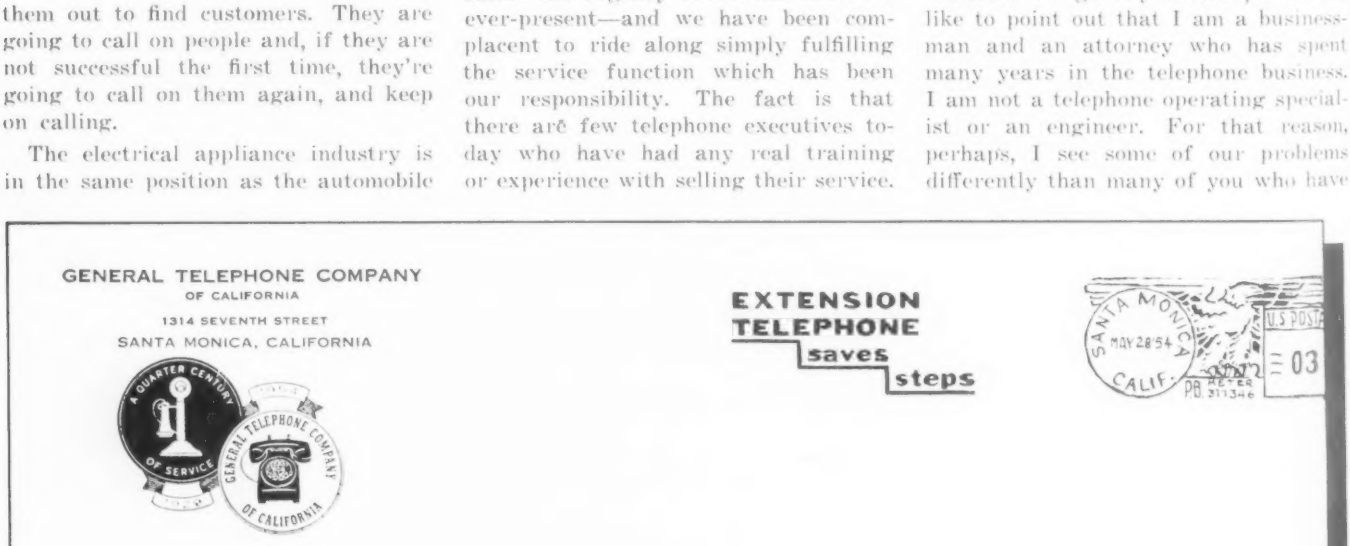
These two businesses, automobiles and electrical appliances—just to take two at random—know the meaning of sales. Their life blood is sales. Their ability to grow and expand depends upon the results achieved by their sales departments.

In some respects the telephone industry is not in quite the same position. As a regulated monopoly we have not developed the intense concentration on sales—the urgency to sell has not been ever-present—and we have been complacent to ride along simply fulfilling the service function which has been our responsibility. The fact is that there are few telephone executives today who have had any real training or experience with selling their service. For many years we have been trying to meet an unprecedented demand for service; with thousands upon thousands of held orders, the idea of selling additional service and use was given little, if any, attention.

Today, the picture is changing and the need for intelligent sales efforts on our part is becoming more and more apparent. We have a good product which more people can use. We have additional services to offer which most of our subscribers don't even know about. We have securities to sell to the investing public—and take my word for it, this item of selling to investors is no small job for most of them never heard of the Independent telephone industry, even remotely.

EXTENSION TELEPHONE — For convenience upstairs, in the kitchen, den, or garage locations. Or if a portable telephone is more convenient, have jacks installed in suitable locations. Then you can take your telephone to the next room or across the house and just plug it in!

Before we go any further, I should like to point out that I am a businessman and an attorney who has spent many years in the telephone business. I am not a telephone operating specialist or an engineer. For that reason, perhaps, I see some of our problems differently than many of you who have



One phase of General Telephone System's campaign to install more extension telephones is the metered mail approach shown above.

LONG DISTANCE CALLS — Many are not aware that they can talk long distance for such a small price — an even greater bargain now that excise tax has been cut to 10%.

been in the technical end of the telephone business all your lives. I believe the telephone industry urgently needs both types—the technical specialist and the businessman. With the immense reservoir of technical ability now stored within our industry, I have never been concerned with our operating and technological development. I have been deeply concerned—and I have said this on many occasions—at our seeming reluctance to take the necessary steps to earn a reasonable profit on the fair value of our property. There is nothing immoral about making a legitimate profit. I believe it can be done in the telephone industry if we follow a course of aggressive hard selling which will enable the business end of the telephone industry to keep pace with our technical development.

Let me tell you about one or two things which we have done in the General Telephone System which I believe will demonstrate my point and will be interesting to you. We decided, after some rather careful planning, to make a concentrated sales campaign of extension telephones in March of this year. We prepared our newspaper advertising on a coordinated basis so that the same ads would appear in all papers within our operating areas at the same time. We developed a uniform postage meter ad so that every customer would get the word "extension" put in front of him. We prepared bill inserts telling every subscriber about extension telephones. We called subscribers on the telephone to talk with them personally about extensions. We sent our commercial people from door to door to discuss extensions; we had them call also on business people. We instructed employes on how to sell extensions. We had our installers carry two telephones into a home or business office when making a primary installation — and taught them to sell extension telephones. We did everything we could to sell extension telephones—and we worked hard at it.

I am happy to say that the results exceeded our most optimistic estimates. It can be done but it takes work—sales work—and that means going out to get the business.

Right now we are beginning to push a campaign to persuade our subscribers to use long distance more often. The excise tax on long distance calls has been reduced. This will help us. We are telling subscribers to call long distance by number to save them and us time. We have furnished our subscribers with personal long distance telephone books for keeping frequently called numbers. We have our traffic department alerted to the public relations job the operators can do in completing long distance calls. We are keeping a record of toll calls completed by each office and if the percentage isn't close to 88 to 90 per cent we find out why. We advertise that people on vacation should call home. We exploit each holiday as a chance to use long distance. We are going to sell long distance as hard as we can and I am certain we will find our long distance revenues climbing higher than they were in 1953.

TELEPHONES FOR HARD-OF-HEARING — Only a fraction of those hard-of-hearing know that they could carry on a normal telephone conversation on this instrument with a built-in amplifier and adjustable volume control.

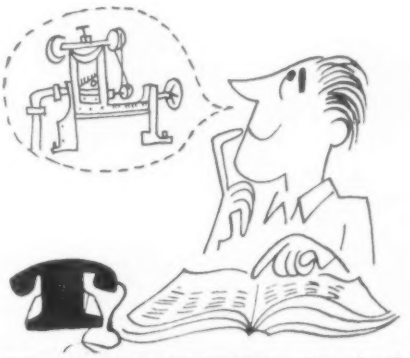
For a minute I would like to talk about selling as it applies to securities. As you probably know, my office is in New York City and I am in almost daily contact with the financial community. To my way of thinking, the financial analysts and others connected with the marketing of utility securities are among the most astute business people I have ever known. They want facts about your company and complete information. From that point on you can rely on them to interpret your operations and the financial position of your company accurately. The analysts will even go so far as to prepare extensive reports which summarize their recommendations. But, this is only part of the battle in marketing securities.

OUTDOOR SIGNALS — Customers who spend their summer evenings in the back yard won't miss important telephone calls if they have an outdoor bell.

As good as the security analyst's report may be, the real problem comes with the investor. Every person who has saved some money and wants to invest will ask his broker, banker, customer's man, or some one who is supposed to know about securities, for a recommended stock. And let me point out at this point, when it comes to selling your company's securities, you have no monopoly. You must compete for the investor's dollar in the open market. You want to try some time to convince a potential purchaser that your securities represent a better value than those of General Motors; or that your operation represents greater diversification than DuPont.

So, in selling to the investor, you must first cope with the problem of recognition. Your company must be well known. A new investor will not purchase your securities if he doesn't know about you or about your company. When his broker recommends a good but unknown security to him, the usual answer is "That sounds all right,

EXTRA DIRECTORY LISTINGS — A small monthly charge makes a separate listing available to any member of a business firm or household. This is good insurance against lost calls.



"YELLOW PAGE" ADVERTISING — Our subscribers can gain new business contacts from potential customers who are looking for a specific service in the yellow pages.

★ ★ ★ IN THE ★ ★ ★ NATION'S CAPITAL

by FRANCIS X. WELCH — WASHINGTON EDITOR

Question raised by congressional filibuster over revision of Atomic Energy Act of 1946 is whether or not, and how soon, state socialism may eventually come to be enthroned as an official policy of the federal government. Delaware court modifies ruling on value of plant in Diamond State Telephone Co. case. Kansas commission rules against co-op's financing plan.

A LOT OF people these days are wondering just what all the shooting is about in the United States Senate over the administration's bill to revise the Atomic Energy Act of 1946. It is a fair question and an important one, not only for public utilities but all true believers in the preservation of the free private enterprise system in the United States.

It is not overstating the issue to say that what happens to this bill, as finally enacted, may well decide how soon state socialism may eventually come to be enthroned as an official policy of the federal government in Washington. Indeed, the decision which the present Congress makes on the future development of atomic energy, whether by government or by private enterprise, may some day stand forth in the politico-economic history of our country as a tide-turning battle in favor of one philosophy or the other.

The sharpness of the issue and the fundamental nature of the conflict suggest an allegorical comparison with such historical turning points as the battles of Thermopylae, Poitiers, Hastings, or Waterloo. Do the people of the United States understand all this? Probably not very many do. Do the Senators understand it? Some do, undoubtedly. But your correspondent wondered about these things, as he stumbled around the darkened halls of the Senate last week, watching a handful of senators sleeping, smoking, or lounging in the small hours of the morning, while inside, almost alone in the Senate chamber, the indefatigable Morse of Oregon droned away with caustic comments about the heritage of the people being preyed upon by the vultures of vested interests.

Just what is at issue here? Is it simply a bill to allow private enterprise to participate in the development of atomic energy? It is that and more. Is it a bill to allow more international cooperation in atomic weapon development and use among the Western Allies? It is that and more. If those two features, however, were all there were to the bill, it could have gone through the Senate without more than a day or two of debate.

The real struggle was over something else, something which occupies only a small section of the 103-page bill, and something which might strike the casual observer as relatively minor. It had to do with a provision allowing the Atomic Energy Commission (AEC) to contract with private electric utility companies to build a power plant at West Memphis, Ark. This plant would supply power, not directly to AEC, but to the Tennessee Valley Authority (TVA), which already has a government monopoly over power production in Tennessee, thereby enabling TVA to release some of its own power to AEC elsewhere.

Why couldn't the TVA build its own plant and produce all the power needed both for the Memphis area and AEC? It not only could, it wanted very much to do so. But President Eisenhower, who once said TVA was an example of "creeping socialism," thought that this was a good place to halt the expanding government territorial monopoly in the power business. And that is what the fight was really about. The public power zealots found themselves in the minority for the first time in two decades. So they filibustered—fought against any vote to pass the bill.

What is commonly overlooked in this struggle is the almost sure fact that one day—10 to 20 years hence—atomic energy will be the basis for more and more, and perhaps eventually all, of our electric power supply. More than that! By industrial application of its heating by-product, it will account for the nation's heating, air conditioning, as well as power and light supply. Think of what this will be eventually in terms of present fuel industries: Oil and natural gas, coal and the heavy investment in hydroelectric facilities. The day will come, and many who read these lines will live to see it, when virtually all of our industry and much of our residential living facilities will be based on atomic energy supply. It will become the lifeblood of our economic system.

All right. Who is going to run it? If the government runs it, it will be a government monopoly. No private business has ever been able to compete on equal terms in the same area with a government monopoly. This is primarily—as in the case of that blue-ribbon exhibit, TVA — because such government enterprises enjoy the advantage of not paying for the capital they use (since it is provided at the taxpayers' expense), and not paying the taxes which private business must pay.

But mainly, private competition would be foredoomed because of political pressures which have historically made such struggles unequal. The combination of political and economic power, controlled by a bureaucracy, capable of perpetuating itself by domination over all forms of labor, business, social, cultural, educational, and propaganda activity would eventually tolerate no opposition, even if the latter could survive. Try to start in the electric business in Tennessee today and you will find your activities outlawed from the very beginning. No business can ever compete with its own government and survive very long. Government just won't stand for it.

Such drastic changes as atomic energy will make are, in themselves, no

threat to our capitalistic system, unless atomic energy falls into the absolute control of a government monopoly. Comparative revolutionary changes have happened in the past. But, under the competitive enterprise system, the transition was orderly. The coming of the automobile, for example, made the livery business obsolete. Some people lost money. But more people made money. *And it didn't cost the taxpayer anything!* Smart outfits like Studebaker, which used to make farm wagons, switched over and began to make automobiles. And, so it would be in the future if private enterprise is allowed to function in the field of atomic energy.

People who now have their money in oil, coal, gas, and other lines which may be affected, can switch over either their investment or change the nature of their business operations to fit into the new picture. That is the sort of thing which has always taken place and is constantly taking place under the capitalistic system And, the best part of it is, the investor has a free choice to put his money where he pleases. Nobody forces him—as is the case with the taxpayer's investment in government enterprise. If a government monopoly takes over atomic development, private enterprise will be strictly on the outside looking in. The government monopoly starting in a given spot will grow and grow.

That is the real importance of the recent filibuster over the atomic energy bill. Those who favor the establishment and growth of state-owned monopoly were fighting from the well-prepared breastworks of TVA—a well-engineered and well-managed public enterprise, so far, overlooking its subsidies and other advantages. They were also fighting from the breastworks of the present federal monopoly of atomic power. But they were in a novel position. They were on the defensive! Private enterprise was on the offensive, following the lead of President Eisenhower.

Some of the senators, of course, were either unaware of the real stakes or were influenced by other considerations. There was a certain amount of pork barrel appeal to the location of facilities to be financed with federal spending. Heretofore, TVA has had its own way and Tennessee senators naturally would like to see the gravy train continue in that state. Arkansas senators would like to see some of the gravy come over into their state. But, on the whole, the issue involves the question of whether the majority of the American people want the federal government to move further into private industry. The Eisenhower administration has taken the line that the people do not want a continuation of that policy; and the battle which his administration put on, proved that the President meant what he said.

And, so, when the charges and countercharges of "give-away" and government monopoly are cleared away, what Congress does in this bill will become very important 10 or 15 years from now, in the life of every American citizen, even if millions of those citizens today are not even remotely aware of it.

It was back in 1902 when the electric industry was in its infancy that the Theodore Roosevelt administration sponsored a reclamation bill which was later amended with an innocuous provision in favor of the federal government selling "surplus" power to municipalities and other public agencies. It was on such an obscure and vague premise that the present public power movement, which has gobbled up one-fifth of the electric utility industry in the United States, moved aggressively in long strides. By a combination of fancy bookkeeping and fancy propaganda a good many people were persuaded that year after year, when hundreds of millions were *spent* out of tax monies, on public power projects, it was all done to *save* us some money! Each subsequent federal power statute enlarged the government's authority in favor of public ownership until a little more than a year ago, the federal policy seemed actually dedicated to the eventual *extermination* of private enterprise in the electric utility business.

President Eisenhower's administration now declares that this trend must be halted. State socialism must be contained, not encouraged. Hence the battle to keep the opening wedge of the public power socialists out of the important basic atomic energy legislation now being completed by Congress.

Delaware Modifies Value Ruling

The Delaware Supreme Court by a 2-to-1 decision has handed down a ruling which substantially modifies a very forthright decision of the lower court in that state, interpreting for the first time the Delaware public utility law. It will be recalled that Delaware was one of the last states to set up a state regulatory body. In fact, it was *the* last state to set up some kind of a commission, although the commissions in several other states, such as Texas, have only limited jurisdiction, mainly over transport carriers. The Delaware law was passed in 1949 and established a full-powered three-man commission.

Of special interest to telephone companies, however, was the decision of a lower Delaware court—the superior court with Judge Caleb R. Layton III presiding—which was discussed in this department in the Mar. 13 issue of TELEPHONY. In that case, Judge Layton set aside a ruling of the Delaware commission involving the Diamond State Telephone Co. for the reason, among others, that the commission had not given sufficient recognition to reproduction cost. The commission had valued the company's property at 22 million dollars, as against the company's estimated value of 28.7 million dollars. The lower court (Judge Layton) struck a judgment figure between these two of 25.5 million dollars, which was based on the reproduction cost study scaled down about 10 per cent to compensate for possible errors.

The majority opinion by Justice James Tunnell Jr., of the Delaware Supreme Court, now finds that the lower court erred twice in this determination of the Diamond State Telephone Co.'s rate base. First, the lower court should not have made its own finding as to a rate base, but should have remanded the case to the commission for action by the latter in the correction of any errors in the commission's calculations. Second, the lower court was found to have given undue weight to reproduction cost, although the Delaware Supreme Court does not exclude that element as a proper measure of rate base determination. This is an important point of the higher court's decision to bear in mind.

Regarding the lower court's substitution of its own opinion for that of the commission, the higher court's decision by Justice Tunnell stated:

"The duty of the superior court in these cases is to sit as a reviewing court, not as an administrative agency of superior rank. . . . Apart from the requirements of judicial review it is not for us to advise the commission how to discharge its functions. . . . He (Judge Layton) did it to save time. In respect to a single cause, the superior court's assumption of the commission's prerogatives does appear to hold out the possibility of saving time. In the broader view, however, time is saved when litigation is brought to an end in the lower courts.

"For the superior court to amend findings simply because it would have made different ones would not only be a misapplication of the law but would tend to reduce hearings before the commission to the status of mere rehearsals. The true rule saves time in the long run."

With respect to rate base determination, the state supreme court majority opinion said that the Delaware public service law is not designed "to permit

(Please turn to page 36)

CARRIER SYSTEMS

By HAROLD B. McKAY

Part 3—Use of Carrier Systems

THE BASIC use for a carrier system is to put additional voice or signal paths on a single circuit. Perhaps in its simplest application, a single carrier channel could be hooked up to a single voice-frequency physical telephone circuit, and thereby provide an additional talking path. For instance, if a company had one open wire line connecting two exchanges many miles apart, and traffic demanded another circuit, a carrier terminal at each end would do the trick.

The carrier equipment, which would place an additional channel over the same line might cost about $1,500 or $2,000, while stringing an extra wire circuit would cost much more.

Further, carrier systems are not limited to only one channel. Some systems are designed to carry up to 24 separate conversations or signals over the same two or four-wire land line. In addition, in some cases more carrier systems can be added to a circuit which already has carrier in use. For instance, a company might start out with a small system of three channels, then later get another carrier system of higher frequency than the first one, and place it on the same physical circuit.

This does not mean that a carrier system can be placed in operation on the classical barbed wire fence line. Indeed, the wire line must be in good condition, and must be properly transposed for the frequencies to be used. In addition, there are other considerations including proximity to noise sources, legs or branch circuits and intermediate drop-off points.

Analysis of Operation

In order to understand how a carrier system operates, and how it manages to place several conversations on the same wires, a simple comparison to an ordinary telephone circuit will be most revealing. In fact, it may be said that there is no part of a simple carrier system which does not have its counterpart in a regular common battery telephone line.

Take the word "carrier" itself. It refers to the current which "carries" the voice to its destination. In the common battery telephone, direct current is supplied to the transmitter from the central office. As speech affects the transmitter, the direct current flow is caused to rise and fall. This rise and fall can easily be seen if a meter is connected to the transmitter while somebody shouts into it.

This fluctuating direct current "carries" the voice to the office, and ultimately to the receiver at the distant end. Therefore, the dc on the telephone line may be thought of as a carrier current, even though of zero frequency.

Now, if 60-cycle alternating current were supplied to the transmitter, this ac would become the carrier, but a frequency this low could be heard in the receiver and mask the conversation, so cannot be used. The same would apply if any low frequency, such as 400-cycle dial tone, or 1,000-cycle transmission test tone were used. Even though practically unusable, these alternating currents would still "carry" the voice.

In practical carrier operation, a frequency is chosen which will be high enough so that it will not be heard in telephone receivers.

In our simple description of the telephone, the transmitter was seen to cause the carrier voltage to vary. This process is called *modulation*. In the earliest days of radio, the high frequency radio carrier current was actually modulated by using a king-sized carbon microphone in series with the antenna lead. Thus, the voice caused the high frequency current to vary in strength.

Modern radio and carrier equipment does not send the high frequency carrier current directly through the transmitter, but uses more efficient means. In telephone equipment, the voice current which is carried by the dc is actually a small alternating current. At the central office, this ac voice current is separated from the dc by means of repeat coils (transformers) or condensers.

If this particular conversation is going into a carrier system, this small ac voice current is connected into the carrier.

Application of Theory

It was seen in an earlier chapter that a coil-condenser-vacuum tube circuit could be made to generate an alternating current of any frequency. Every carrier equipment contains such an oscillator. There are many different designs of oscillators, other than the one previously discussed, and different manufacturers use different wiring methods and arrangements to achieve the results desired.

However, electrically all are the same—the frequency is set by the coil and condenser, the tube keeps the alternating current circulating around the circuit by supplying power to make up the losses. Each makes use of the amplifying qualities of the tube.

In view of the fact that this carrier

current was not sent out to the customer's transmitter to be modulated by his voice, some means of getting the voice current and the carrier current together is needed. Just as the voice itself modulated the dc in the transmitter, the resulting ac voice current can be made to modulate the carrier current, and the device which does this is called the modulator.

Carrier Modulation

If several alternating currents of different frequencies are sent along the same wires, they will remain separate from each other, and can be separately extracted from the circuit at a distant point. Only the original frequencies sent into the circuit will exist on the line.

However, if any non-linear device (one that does not follow Ohm's law) is put into the circuit, the different frequencies will mix, adding and subtracting from each other.

It has been shown that a vacuum tube can be made to act like a non-linear device under certain voltage conditions. A carbon grain transmitter, or most any other loose connection, will do the same thing. In fact, a transmitter will often mix the signals from a nearby radio station with the signals on a telephone line, causing the customer to hear the radio station on the telephone.

Among the substances which have this property are copper oxide and certain types of crystals, such as silicon and germanium. Therefore, if two frequencies are sent together through these materials, the two frequencies will both add and subtract, creating two new frequencies as well as the original ones.

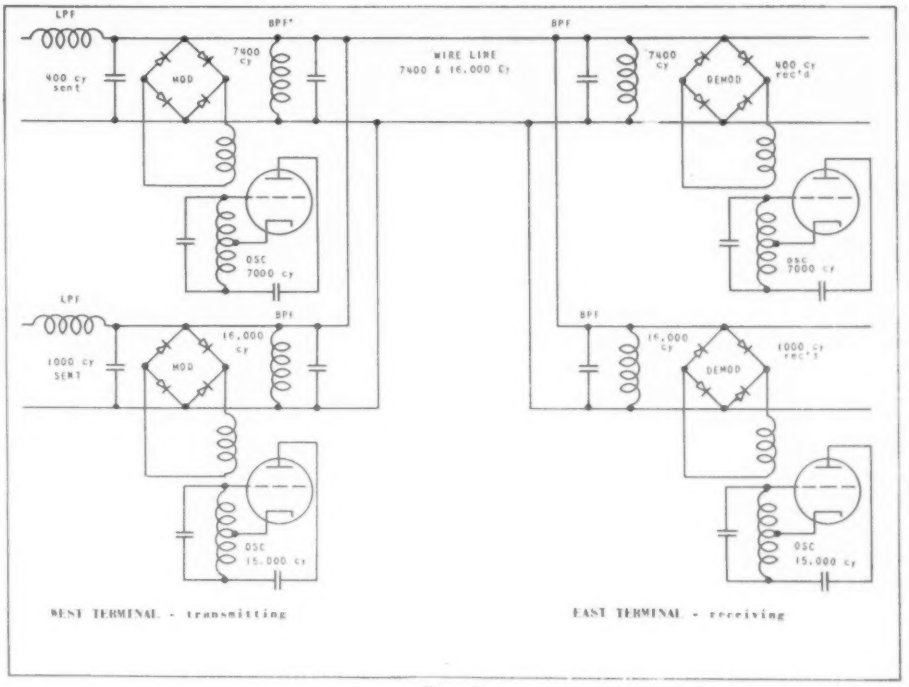


Fig. 13

For instance, a three-channel carrier system may use 7,000 cycles as the frequency for the first, or lowest channel. This frequency is generated by an oscillator which is part of the carrier.

The voice currents from a telephone circuit are brought into the carrier and mixed with this 7,000-cycle current being generated in the carrier equipment. This mixing can be done with either a tube or a crystal. Radio equipment usually uses a tube, while crystals are used mostly in carrier equipment.

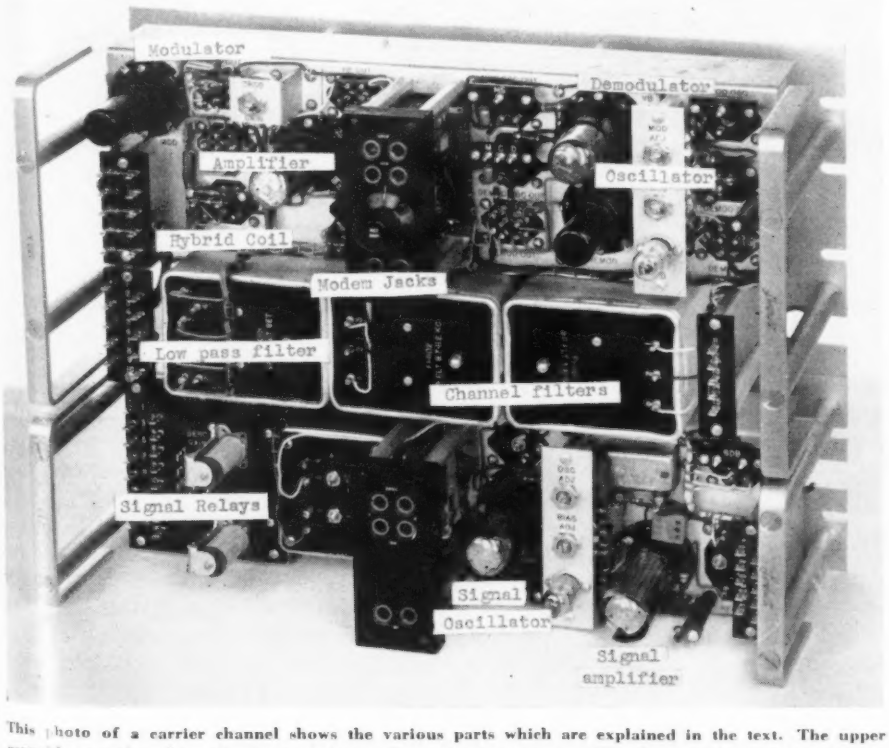
When the voice currents arrive at the crystal modulator, the carrier frequency is said to be "injected" at this point. Suppose dial tone at 400 cycles is being sent over the telephone circuit. This tone will mix with the carrier frequency and will both add to and subtract from it. The output would then have frequencies of 7,000, 400, 7,400 and 6,600 cycles present.

Of these, the figures 7,400 and 6,600 represent the result of the carrier and signal frequency mixed together. If either of these two frequencies were sent over a pair of wires to a distant point, the original 400-cycle tone could be recovered and heard, if a frequency of 7,000 cycles were subtracted or added as the case might be, from the received mixed signal.

If a second carrier channel is put on the same wires, it would use a different carrier frequency, say 15,000 cycles. Now suppose we wish to transmit a 1,000-cycle test tone or ringing signal over this channel at the same time the 400-cycle dial tone is going over the first one. In this case, when the 1,000-cycle tone is mixed with 15,000-cycle carrier, four frequencies again result, 1,000, 15,000, 14,000 and 16,000. Again either the 14,000 or the 16,000-cycle signal would contain both the carrier and the tone frequency with which it was modulated.

If either of these two frequencies is sent to the distant end, and a 15,000-cycle signal added or subtracted as required, the original 1000-cycle tone would be released and heard.

These frequencies, which are mix-



This photo of a carrier channel shows the various parts which are explained in the text. The upper assembly contains the voice transmitting and receiving apparatus. The lower unit contains the signalling equipment which will be used with the channel. (Photo courtesy of Lenkurt Electric Co.)

tures of the signal and the carrier are called side-bands, and each time a carrier is modulated, two sidebands result. Actually, it is only necessary to transmit one of these sidebands, and many carriers use what is called the single sideband system. Some, however, may transmit the carrier to the distant end also, as will be explained later.

If the upper, or highest frequency sideband were transmitted in each of the above examples, two frequencies only, 7,400 and 16,000 cycles would go over the wires to the distant end. At the transmitting end of each of these channels, tuned circuit filters would be employed, which would pass these frequencies, but suppress others, including the basic carrier frequency and the lower frequency sideband.

At the receiver end, additional filters would be employed, which would receive the 7,400 cycles in one channel and the 16,000 cycles in another. Because of the different frequencies used, and the tuned filters employed, two different kinds of signal are sent over the same wires, and unscrambled at the end without interference to each other.

Fig. 13 shows a simplified system which illustrates the above examples. The operation of the bridge type modulators, and their counterparts in the receiver, the demodulators, may be understood by inspecting the circuit.

The little arrows represent crystals or copper-oxide coated disks. These act as rectifiers as well as non-linear elements, and will pass current in only one direction. In the drawing, assume that the current will flow only in the direction the arrows point. In tracing a path from the 400-cycle input, coming in on the top lead, it will be seen that the current is blocked by the upper left and lower right arrows. When the current reverses, the other two block it.

Tracing up from the oscillator it will be seen that this path conducts when traced from left to right, but blocks when traced in the opposite direction. As a result, the 400-cycle current can continue past the modulator onto the line, but the oscillator current cannot get onto the line. This is the principal means by which the carrier is suppressed in single sideband systems.

However, if both oscillator and 400-cycle currents are applied at the same time the combined result is that when the oscillator current is positive on the left hand leg, current flows through all of the rectifiers. These units have a varistor action, and their resistance lowers as current flows in them.

Ordinarily, the carrier frequency current is much greater than the voice current, so the lowered resistance of the bridge units acts as a short circuit across the line. This effectively shunts down any voice currents, or in this example, the 400-cycle tone, and none goes on the line. When the carrier frequency reverses, the crystals pass no current, the shunt is removed, and the tone or voice can go out on the line.

In a manner of thinking, it might be said that the carrier chops the signal up at a high frequency rate. This modulation process makes itself felt by sending out two frequencies, one the sum and the other the difference between the carrier and the signal. The carrier itself never gets past the crystals, and either the upper or lower (sum or difference) sideband frequencies may be eliminated by high or low-pass filters.

Demodulation

The demodulator is used in the receiving end of a carrier channel. Its purpose is to recover the original voice or tone being transmitted, and send it to a circuit where it can be heard.

As the signal was originally put on the carrier by adding or subtracting it to the carrier frequency, the receiver must reverse this addition or subtraction in order to recover the original sound. The demodulator which does this is circuitwise exactly the same as the modulator. The modulator and demodulator for a single channel unit are often mounted together and are called the "modem" from a combination of the two words.

An oscillator is provided at the receiving end, which is of the same frequency as that at the transmitting end, and it is fed into the demodulator in the same manner as into the modulator. While the modulator took a 400-cycle tone, mixed it with 7,000 cycles to get 7,400 and 6,600 cycles, the demodulator takes the 7,400 cycles which was transmitted, mixes it with 7,000 to get 14,400 and, most important the original 400 cycles.

In the modulator, filters removed the unwanted 6,600 cycles and any 7,000-cycle carrier that might have leaked through. The demodulator has filters which block the 7,400 and 14,400, but permit the 400 cycles to pass through.

A prime requirement in single sideband systems is the stability of the oscillators in the equipment. These devices must be built of precision parts so that the frequency will not drift more than a few cycles. For example, in the case of the 400-cycle tone being transmitted in the above illustration, if either the transmitter or receiver oscillator were as much as 10 cycles away from the required 7,000-cycle frequency, when the subtraction or addition was made at the receiving end a frequency of 390 or 410 would result instead of 400 cycles.

If this error in oscillator accuracy became too great, it would result in changing the pitch of voices which were being transmitted. In practice, these oscillators are quite stable, although some are equipped with adjusting devices for field line-up.

Transmitted Carrier Systems

Some carrier systems do not suppress the carrier frequency, but transmit it also with a sideband to the receiving end. These systems do not require the bridge type modulator which drops the carrier. Instead, a single crystal can be used to mix the frequencies. Regular radio broadcasting stations send out their carrier along with the sidebands.

Like a signal from a radio station, the voice can be recovered from a transmitted carrier system by means of a simple crystal detector, similar to that used in the early days of radio. Because the original carrier frequency is included in the received signal, it is not necessary to have an oscillator in the receiver to generate it. Thus, the system may have fewer components, and require less adjustment.

The process of crystal demodulation or detection in a transmitted carrier system may be understood by remembering that the crystal is a rectifier, and will pass current in one direction only. If the carrier with its sideband were sent directly into a telephone receiver, the diaphragm would not respond to the high carrier frequency, because it could not move back and forth that fast.

However, if the current is rectified into pulsating dc, the pull on the receiver diaphragm will always be in the same direction. Because the voltage of the carrier current is wavering up and down because of the fluctuating voice currents in the transmitter end, the pull on the receiver diaphragm will vary also, and hence reproduce the voice. If the current were not rectified, the diaphragm would pull in one direction on the positive half-cycle of the carrier wave, but before it could move, the negative half would come along and push it in the opposite direction, thus canceling itself out.

It is of interest to note that a telephone receiver itself has a type of detector function built into it in the form of a permanent magnet. This magnet exerts a steady pull on the diaphragm, biasing it in one direction. The incoming voice signals either aid or oppose the magnet, pulling the diaphragm closer, or letting it spring away. However, because of the magnet, the dia-

phragm is never pushed away from the coil by the alternate halves of an alternating current cycle.

If a receiver was made without a magnet, the diaphragm would respond to both sides of the ac wave, so that each single element of sound would result in two movements of the diaphragm. This would have the effect of doubling the frequency of any signal received. A basso profundo speaking on such a line would sound like a tenor at the receiver. Older type receivers became tinny as the magnets weakened because of this effect.

Thus, the process of detection, which is essential in carrier systems, has always been with us in another form in our telephone receivers.

Band-Width

In our previous examples of carrier transmission, two frequencies, 400 and 1,000 cycles were used to demonstrate principles. In telephone communication, we need higher frequencies than these in order to provide a commercial grade of transmission. The human voice may contain overtones and harmonics which run to several thousand cycles, but it has been found that crisp, clear speech results if the frequencies of about 200 to 2,800 cycles, more or less, are transmitted.

Carrier systems are, therefore, designed to transmit this range of frequencies. As a result, the range between the lowest and highest frequencies on a carrier channel is increased by this amount.

For example in the 7,000-cycle channel mentioned earlier, if the full carrier and both sidebands were transmitted, we would have to be able to send 7,000 minus 2,800 or 4,200 cycles, as well as 7,000 plus 2800 cycles or 9,800 cycles. The range between 4,200 and 9,800 cycles would be the band width of this channel. The total amount of frequencies available in carrier or other work involving radiant energy is called the spectrum. This system then would take up a "space" in this spectrum of 9,800 minus 4,200 or 5,600 cycles. Of course, frequencies in this range could not then be used by another channel.

It is for that reason that one of the sidebands or the carrier and one of the sidebands are suppressed in some systems. In the 7,000-cycle system mentioned, if the lower sideband were suppressed along with the carrier, only the frequencies from 7,000 to 9,800 cycles would be transmitted. This would mean a bandwidth of only 2,800 cycles instead of the 5,600 required if the carrier and both sidebands were sent. Hence, in a given frequency range, more single sideband systems can be placed than can transmitted carrier-double sideband systems.

Two-Way Transmission

In the illustrations given so far, transmission was shown in one direction only. Of course, a telephone circuit must be able to talk in both directions. Some multi-channel carrier systems use two pairs, one for each direction of transmission, but three-channel systems ordinarily use only one pair of open wires.

In order to keep the transmission in one direction from interfering with that in the opposite direction, different carrier frequencies are used for each direction. In effect this means that six channels are required out of the available "spectrum" of frequencies, for three conversations.

Vacuum tube devices are essentially one-way affairs, and this applies to carrier systems also. While our drawing in *Fig. 13* showed the transmitters at one end, and the receivers at the other, a real carrier channel consists of both a transmitter and receiver at each end.

The transmitter, it was seen, had a two-wire input from the voice circuit, and the receiver has a two-wire output to the receiver. But subscriber telephone lines have but one pair of wires to serve both the transmitter and receiver. Therefore, a means must be used to convert the four-wire carrier requirements to the two-wire telephone line requirements. The two pairs from the carrier cannot be simply bridged together to make one, because this would permit the received sound to be re-transmitted out to the distant end and back again, then to make the round trip again. This would cause the system to feed-back or oscillate (sing). This would be particularly true in systems which include amplifiers.

Different means are used to prevent this condition from occurring. Some systems have a resistance network connected between the four-wire carrier and the two-wire line. This network presents a relatively low resistance between the line and the carrier, but offers a higher resistance between the transmit and receive sides of the carrier.

Another method uses a "hybrid coil." This is a repeat coil or transformer which has one or more windings wound in the opposite direction to the others. This device is so connected up that the windings assist when transmitting between carrier and line, but oppose currents which would flow between the two pairs of the carrier.

It might be observed here that the end of the carrier which is connected to the open wire line also has the transmit and receive circuits tied together on the same line. However, feedback cannot occur here, because the transmit and receive frequencies are different and each is protected by filters.

Amplifiers

Because carriers are ordinarily used on long-haul circuits it is desirable that amplification be used in order to keep up the level of transmission. This is comparatively easy to provide in carrier equipment. The amplifiers, which follow the general design of the basic type shown earlier in this series, may be placed at different points in the system.

A channel transmitting amplifier may be installed in the individual channel at a point just beyond the modulator. The grid of the amplifier tube picks up the mixed signal and carrier frequencies, then boosts them before sending them out on the wire line. A system of this type would, therefore, have an amplifier tube in each channel.

Another method is to use a "transmitting group" amplifier. This would be installed directly on the wire line. Each channel would feed into this amplifier, and the tubes would amplify all channels at once. The amplifier would be equipped with filters which would pass the bandwidth occupied by all three channels instead of only one.

This type of amplifier may be an integral part of the carrier equipment, or an optional unit to be added on long-haul circuits.

The receiving portion of a carrier channel also uses an amplifier, in order to compensate for the losses that occur as the carrier current travels over the wire line. Again, the amplifier may be placed in different parts of the circuit. One amplifier may be used to boost all of the carrier channels as they come in from the wire line. A single channel frequency may be amplified before it is detected or demodulated, or the voice frequency may be amplified after it is recovered from the carrier.

Where signaling, such as dial pulsing is sent over a carrier system, additional amplifiers may be used to handle the signals only.

Repeaters

In addition to amplifiers which may be at the ends of a carrier system, it is sometimes necessary to place repeaters at intermediate locations along the line. The distance from the terminals and spacing of repeaters varies widely with the systems used.

A repeater is ordinarily a simple amplifier, and like terminal amplifiers may boost several channels at once. It is much simpler in construction than a terminal, because it does not require

(Please turn to page 38)

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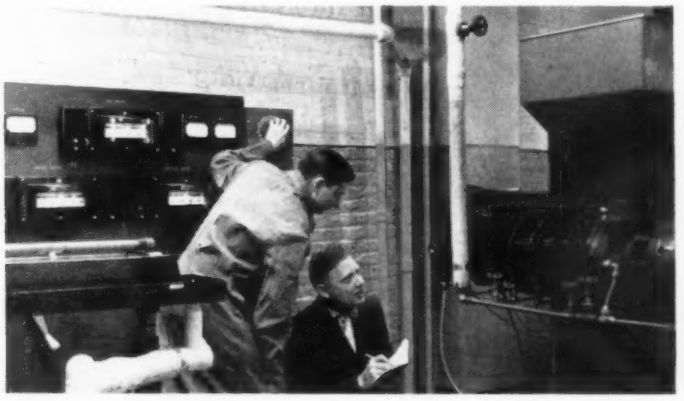
Left to right, C. F. Ffolliott, J. F. Harm, E. S. Peterson, R. J. Maguire, L. F. Crabtree, J. E. Ostline, F. E. Wood, O. D. Grandstaff, I. Molnar, R. C. Stiles, and R. P. Dimmer.

"It makes a more economical mounting for this toll ticketing detector."

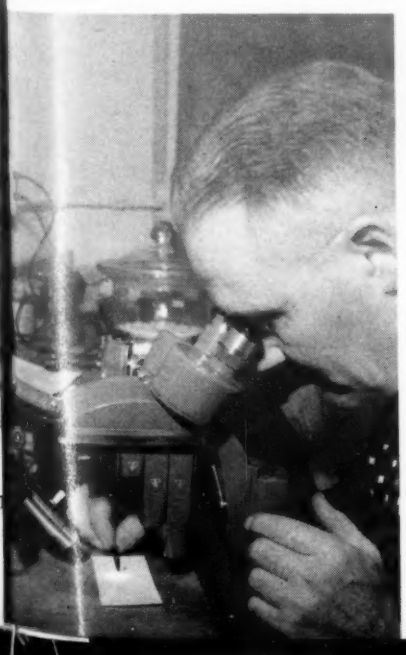
"A design revision here will give this rotary switch greater bank capacity."

"This will show us how to get smoother switch operation."



"Let's see if Compound 12 has better insulation resistance."

"With transistors, the aim is surer processing—and a surer product."



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AT&T — Submarine CableTo Link U. S. and Alaska

PLANS for an underwater telephone cable system linking the 48 states with Alaska were announced on July 19.

The Long Lines Department of American Telephone & Telegraph Co. announced in New York City that it had filed an application with the Federal Communications Commission proposing construction of the system, which will stretch 800 nautical miles between Port Angeles, Wash., and Ketchikan, Alaska.

The cable will connect with facilities of the Alaska Communication System to central Alaska.

Long Lines said the projected communications route was to be completed by late 1956 and would provide, for both public and defense purposes, a speedier means of telephone communications between Alaska and the United States proper.

At present, telephone service between Alaska and the United States is provided over 13 radio and landline circuits, which are inadequate to handle current and estimated future traffic requirements. The new cable system will be less subject to interruptions than existing facilities.

The company said: "It is expected that the demand for message telephone and private line services between Alaska and the United States proper will continue to grow rapidly as a result of the economic and industrial development of Alaska and the military activity centered there."

The company said the proposed submarine telephone cable will provide a short and direct route between Alaska and the United States; that cables require little maintenance and are not subject to damage from storms and the elements, and that cable circuits also provide privacy and security.

The proposed route, according to Long Lines, will have a capacity of 36 message circuits and be constructed at an estimated cost of 14 million dollars.

The AT&T also proposed that it build a radio relay route to carry the circuits from Port Angeles to Seattle, Wash., where they could be connected to the U. S. network of long distance facilities.

The Alaska project would be the second big underwater cable job to be undertaken by the Bell System in recent months. On Dec. 1, 1953, AT&T, the British Post Office and the Canadian Overseas Telecommunication Corp. announced plans to start construction of the world's first transoceanic telephone cable system, which is to be laid across the Atlantic floor from Newfoundland to Scotland to provide direct circuits between New York and London.

The Seattle-Ketchikan submarine cable system would be similar in design to the transatlantic system, Long Lines noted. It would contain built-in underwater repeaters to boost the strength of the voice signals as they travel through the cables. The repeaters are to be spaced about 10 miles apart.

Signal Corps Cable in Alaska

THE Department of the Army on July 26 announced that construction is in progress on a 370-mile Signal Corps submarine telephone cable system linking Skagway and Ketchikan, and other Alaskan points.

When completed, it is expected that the new cable will be joined at Ketchikan with the 800-mile submarine cable being planned by the American Telephone & Telegraph Co. to furnish additional communications between that Alaskan point and Port Angeles, Wash. The Signal Corps segment of the cable system and associated facilities will cost about $6,750,000, the Army said.

The Signal Corps cable is being manufactured in Portsmouth, N. H. When completed, the Army cable ship, Albert J. Myer, will load the cable at Portsmouth and transport it via the Panama Canal to Ketchikan where it will be joined by the Army cable barge, Basil O. Lenoir, for cable-laying operations next spring.

The entire submarine cable system (Signal Corps and AT&T) is expected to be completed by late 1956 and will provide a capacity of 36 telephone circuits. Telephone service between Alaska and the United States is currently handled over 14 radio and landline circuits operated by the Alaska Communications System (ACS), a branch of the Army Signal Corps. Certain of these facilities will continue to be operated as a supplementary system.

The ACS had its beginning in May, 1900, when Congress authorized and di-

(Please turn to page 39)

General route of a proposed underwater telephone cable system, linking the 48 states and Alaska, is shown above.

THE PLANT MAN'S Notebook

by Ray Blain, Technical Editor

IN A RECENT letter from J. L. Robb, assistant to the president of the Superior Cable Corp., the following remarks were made with reference to the problem of splicing plastic-insulated and jacketed cable:

"We are, of course, vitally interested in this problem and we have tried to follow developments in the field as they arise. We have given quite serious thought to the development of a pre-insulated compression connector, but have reached the conclusion that this device has limitations in the splicing of plastic-insulated cables.

"As you know, any device developed to splice telephone cable conductors must be capable of joining 19 through 26 gauge, and it must also be capable of joining various combinations of these gauges such as occur in bridge splices.

"There is also another point which is sometimes overlooked in considering the compression type of connectors. With the pigtail, which is presently used, it is necessary for the splicer to have each wire in the splice take only approximately the same load when the splice goes on tension due to temperature changes. The first few turns of the pigtail are loosely made and the load can equalize with no damage to the conductors.

"With a compression connector, the splicer would have to be extremely careful or a few of the conductors would be shorter than the others and these few would be subjected to the full stress, since compression connectors provide no means of equalization of stresses between conductors. It must be recognized, of course, that the compression connectors will stabilize the electrical connection, but this same stability can be achieved by soldering the pigtails.

"The points mentioned above do not completely preclude the use of compression sleeves in this application, but we feel that there is greater merit at this time, in seeking a material which can be used to restore the insulation level and moisture imperviousness over the splice in an individual conductor when the splice is made in the accepted conventional manner. We are at present testing a number of materials which may provide the characteristics we are seeking."

We are extremely interested in an improved technique for the splicing of plastic cable, and are always pleased to receive ideas from our readers on this subject.

• • •

Work bench tops made of plastic impregnated wood are now available.

Twenty-six standard sizes from 48x24 inches, to 96x36 inches, and varying thicknesses up to 2¼ inches, are now on the market.

The tops are lacquered, waxed and filled to make them oil and grease-resistant and worm, splinter and dent-proof.

Kiln dried lumber is sized, tongued and grooved in narrow widths, then pressure-glued to form the core. Facing boards are pressure-laminated to both sides of the core. Facings are made of wood aggregate that is sized and mixed with a plastic binder before moulding under heat and pressure.

• • •

Some newspaper columnists grind out a lot of copy poking fun at our modern telephone service which we freely admit is the best in the world. There is no need to take offense at these reporters for they must write about something, and it is doubtful if they do our industry any real harm. Then, too, some of them are rather funny, or so we think, as the following will indicate:

"Give me the old-fashioned telephone girls! I'm demoralized. I've been talking with spooks. These up-to-date telephones are too much for me. I walked into a public telephone booth and the lights went on like magic. I picked up the receiver and nothing happened. I fed it a nickel. Still nothing. Another nickel and it started purring like a kitten. These telephones know what they want.

"I dialed, but made a mistake. A pig started squealing somewhere. I hung up and tried again. This time there was a click and a passionless babe with fearfully regular accents started a monologue.

"'This is a recording. You have dialed an obsolete number. Look up the new number in the directory, and dial it.' She rambled on for quite a spell, then I came to. I realized she was talking to me. She was right, by gum! I had dialed an old number. How do you suppose she figured that out?

"I tried again. The telephone rang. There was another ghostly click. Then that passionless female started talking again. Have you heard her? She sounds like a victim of melancholia. Should be in a hospital, she should.

"'This is a mechanical secretary,' she intoned. 'There's no one in this office now.'

"Egad, a real spook!

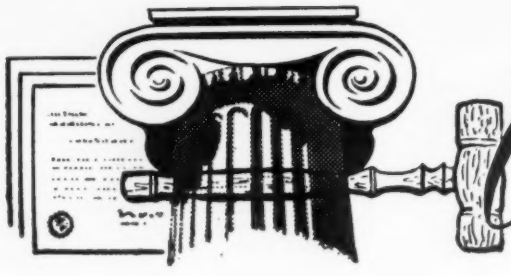
"'In a moment you will hear a gong. Thereafter please leave your message. A recording will be made of it. Leave your number. You will receive an answer to your message when the office reopens.'

"Gadzooks and a couple of bodkins! Who could talk after that? All I could do was gasp. I hung up, despairingly.

"I discovered that my watch had stopped in the excitement. Thoughtlessly I invested two more nickels to find out the time. I should have known better. You can guess what happened. There was that depressed dame again! Honestly, she was. 'At the sound of the tone,' she began. But I fled, goose pimples all over. Blame me?

"So I say, give me those old-fashioned telephone girls! I prefer the kind you know are alive. Don't you?"

If this writer is an old-timer, perhaps back in the day when we had local telephone operators, he poked fun at them too, and accused them of chewing gum and reading novels while on duty. Well, let them have their fun. For in spite of it all, telephone service is certain to expand and improve with the passing years.



Courts and Commissions

Commission OK's Rate Raise For New York Company

The New York Public Service Commission has accepted a tariff amendment filed by Oneida County Rural Telephone Co., Holland Patent, designed to increase rates to subscribers of its Holland Patent exchange and to establish new rates for dial service through its Westernville exchange effective Aug. 1.

In filing its new tariff, the company said additional revenues were needed to meet increased operating costs. The company serves about 800 stations in and near Holland Patent and Westernville. A year ago it purchased the plant of Westernville Rural Telephone Co. and began modernization of its equipment including the installation of dial equipment at Westernville, dial equipment of greater capacity at Holland Patent and 4 miles of cable.

The company estimates the new rates will produce about $4,000 additional annual revenue. Because toll free service between Holland Patent and Barneveld is provided, higher monthly rates apply to subscribers served by that exchange.

Under the new tariffs, monthly residential rates to Holland Patent subscribers are increased by 25 cents while business rates are increased by amounts from 50 cents to $1.00. The new dial service tariff applicable for the Westernville exchange includes these rates: Residence, one-party, $3.25; two-party, $3.00; five-party, $2.50; 10-party, $2.75. Business, one-party, $5.25; two-party, $4.50; five-party, $4.00; 10-party, $4.25.

V V

Delaware High Court Holds Lower Court Exceeded Function

In a decision expected to result in lower telephone rates, the Delaware Supreme Court held on July 23 that the Wilmington Superior Court had erred in taking over the function of the Delaware Public Service Commission and making its own independent valuation of the properties of the Diamond State Telephone Co. in the matter of the latter's application for higher rates (TELEPHONY, Apr. 24, p. 55; Mar. 6, p. 28).

The higher state court further held that the lower court had erred in making its own determination of the needed working capital of the company.

In its 2-to-1 decision, the state supreme court further ruled that the lower court was correct "in remanding for the correction of various errors in the commission's calculation of income."

The high court's ruling upset a Feb. 19 decision by Superior Court Judge Caleb R. Layton III, after which the company had boosted its rates.

Written by Justice James Tunnell, Jr., the high court's decision was concurred in by Superior Court Judge James B. Carey, sitting in the absence of Chief Justice Clarence A. Southerland. Justice Daniel F. Wolcott dissented.

"The commission's valuation of the plant," Justice Tunnell wrote, "should have been allowed to stand, and the commission should have been directed to fix the allowance for working capital. The mandate will direct amendment of the judgment of the superior court so as to bring it into accord with this opinion."

The court majority held that the commission's valuation of company property upon which rates are based should have been allowed to stand at the commission's 22-million-dollar figure. It reversed Judge Layton's 25½-million-dollar valuation of the property. The company had estimated its property value at 28 million dollars.

Entirely upon the basis of an analogy with a Maryland concern, the court said, "the commission was urged (by a state's witness) to find that Diamond State enjoyed an average balance of $678,000 (of working capital) collected from customers but not yet paid out to creditors, and therefore required no allowance for working capital. The commission adopted the view of the state's witness, but Judge Layton reversed and ordered the commission to allow a working capital figure of $100,000.

". . . we think that on this question of evidence there is adequate basis for a direction by the superior court that an allowance be made for working capital."

Going into the question of fair value, the court said: "Although the judge (Judge Layton) said that reproduction cost under the facts was entitled to 'substantial' weight, what he did was to give it exclusive weight. He took the company's reproduction cost study, scaled it down about 10 per cent in order to compensate for possible errors in the study, and fixed a fair value of 25½ million dollars.

After citing rulings by the U. S. Supreme Court, Justice Tunnell wrote: "The force of the reasoning of these deep thinkers is apparent when one envisions the manifest injustices to which a regulated utility would be subject under the reproduction cost rule if it were required to ride a wave of deflation to the trough."

The decision further declared that the law creating the Delaware Public Service Commission and outlining its duties is not designed "to permit us to adopt in pure form either the reproduction cost rule or the prudent investment rule, or, for that matter, any other fixed or definite standard." Each of the elements of value, the opinion asserted, must be given such weight as may be just and right in each case.

"If justice and reasonableness, or justice and right, are to guide us," the court said, "the sad truth is that we are led out of the relatively clear-cut realms of law, logic, and economic formula into the shadowy field of ethics."

V V

Northwestern Bell Gains Rate Approval on New Items

Rates for special items offered for the first time by the Northwestern Bell Telephone Co. have been approved by the Nebraska Railway Commission in an order dated July 2.

These items include handsets with illuminated dials at 25 cents each per month which will provide convenience in dialing telephone numbers at night without turning on lights. Such illuminated dials are also helpful in poorly lighted daytime locations. This special purpose instrument employs a small transformer for use with commercial power for the lighting of a flashlight-type bulb in the dial housing. The re-

moval of the handpiece turns on the light.

Another item consists of 1A1 key telephone equipment to be used interchangeably with 1A key telephones. This new equipment makes several special purpose service features available for the first time. These include a nine-station capacity intercommunicating line at $5.00 each per month. This is equipped with dial selective signaling which provides for pick-up features and additional audible and/or visual signals which will be connected with the intercommunicating path. Also included is an automatic cut-off exclusion feature at $1.25 each per month to be used either with the new dial selective intercommunicating line or with manually operated intercommunicating channels previously offered. These items are also adaptable for use with the 100 multiple type key equipment as well as with 1A or 1A1 key telephone assemblies.

The order also authorizes the rate of 25 cents per month for telephones equipped with push-to-talk or push-to-listen transmitter cut-out switches. These are designed for use in noisy locations to eliminate the feed-back from the transmitter circuit.

V V

Two Minnesota Companies Authorized to Raise Rates

Minnesota Railroad & Warehouse Commission on July 20 approved rate increases for the Franklin Local & Rural Telephone Co. and the Minnesota Telephone Co., Minneapolis.

The higher rate schedule for the Franklin company and its 171 local and 146 rural stations, will raise operating revenues from $14,422 to $17,097. Net income will rise from $772 to $1,786, a return of 4.12 per cent on a plant original cost of $43,401.

The following are the old and the new rates:

	*Old**	*New**
One-party business	$4.00	$5.50
Two-party business	3.50	5.00
Rural multi-party business, common battery	3.75	5.25
Rural multi-party business, magneto	3.25	4.75
One-party residence	3.00	3.75
Two-party residence	2.75	3.25
Four-party residence	2.50	2.75
Rural multi-party, common battery	3.25	3.60
Rural multi-party, Magneto	2.75	3.35

*All rates to be billed monthly in advance and on all gross rates a discount of 25 cents to be allowed if paid on or before the 20th day of the month in which service is rendered.

Increased rates for the Minnesota Telephone Co. will be effective upon conversion to dial of the company's International Falls exchange, and upon the installation of a dial exchange at Ranier, Minn. (now served over rural multi-party lines).

Operating revenues for both exchanges under the approved rates would approach $231,425 as against $183,809 under present conditions. Net income would rise from $23,222 to $44,147, a return of 5.12 per cent on a rate base of $861,817. (The rate base was arrived at by taking the estimated original cost after conversion to dial operation—$850,561, subtracting a depreciation reserve—$18,544, and adding material and supplies — $19,800, plus working capital of $10,000.)

Present rates for International Falls and the dial rates for both International Falls and Ranier, are:

	Present	*Dial*
One-party business	$7.50	$8.50
Two-party business	6.00	7.00
One-party residence	4.25	4.50
Two-party residence	3.25	3.45
Four-party residence	2.50	2.65
Multi-party business	4.25	4.75
Multi-party residence (10 or less)	3.75	4.00

The Minnesota Telephone Co. presently serves 2,967 local and 451 rural stations. The company has on file 475 applications for service, which it says cannot be filled until the conversion projects are completed.

V V

Louisiana Companies Apply for Permission to Raise Rates

The Louisiana Public Service Commission was to have held an Aug. 4 hearing on the application of the Campti-Pleasant Hill Telephone Co. for authority to raise rates.

Another petitioner on the same date was Avoyelles Telephone Co., for permission to increase rates in Mangham, Baskin, Alto and Archibald.

V V

Nebraska Company Authorized to Issue More Stock

The Rodeo Telephone Membership Corp., Burwell, Neb., was authorized on June 25 by the Nebraska Railway Commission to issue not to exceed 1,250 membership certificates and 1,000 equity certificates to be used to obtain additional capital.

Authority to issue such certificates was implied in the commission's order of May 7. The June 25 order was issued to grant specific approval.

V V

Missouri Company Sold to Bell

Southwestern Bell Telephone Co. now has the recommended approval of a Federal Communications Commission examiner for its request to buy the DeSoto (Mo.) Telephone Exchange. More than 2,000 subscribers are served by this exchange.

V V

Two Raises O.K.'d in Minnesota, One to Company with REA Loan

The Remer Rural Telephone Co. and the Woodstock Telephone Co., a borrower from REA, were authorized rate increases on July 20 by the Minnesota Railroad & Warehouse Commission.

The new rate schedule, increasing the Remer company's operating revenues to $12,560 from $9,427, is expected to erase a deficit of $1,014 and produce net income of $1,212. This is a 5.46 per cent rate of return on an original cost of plant of $22,403.

The following are old and new rates of the Remer company:

	*Old**	*New**
One-party business	$4.25	$5.75
Two-party business	—	5.00
Rural multi-party business	3.00	4.25(a)
One-party residence	2.50	3.50
Two-party residence	2.25	3.00
Four-party residence	2.00	2.50
Rural multi-party residence	2.25	3.25(a)

*All gross rates to be billed monthly in advance with a discount of 25 cents to be allowed if paid on or before the 15th day of the month in which service is rendered.

(a) Rural common battery service will be extended only upon demand of at least six subscribers within 5 miles from the central office and said six subscribers are located along the same existing pole lines following the same general direction.

An additional charge of 25 cents per month for a handset instrument to subscribers on local party lines and subscribers on rural multi-party lines.

The Remer company serves approximately 128 local, 106 rural and 89 switched subscribers.

Dial service rates approved for the Woodstock company were expected to raise operating revenues to $9,255 from $7,163 under present rates, and net income to $2,036 from $589. This will be a 3.49 per cent rate of return on an original cost of plant of $58,272.

In its order the commission observed:

"The record shows that in 1950 the applicant received a loan allocation of $42,000 from the Rural Electrification Administration for the purpose of converting the Woodstock exchange to dial operation. Since the original loan allocation, increased costs in labor and materials have necessitated a supplemental loan application for an additional $25,000 to complete payment on the project.

"The Rural Electrification Administration has since advised the applicant that the supplemental loan is contingent upon the approval of the rates herein applied for."

Old and new rates are as follows:

One-party business	$4.75	$6.00
Two-party business	4.25	5.00
Rural multi-party business	3.75	4.50
One-party residence	3.25	4.00
Four-party residence	2.75	3.25
Rural multi-party residence	3.25	4.00

Old Rates: All rates to be billed monthly in advance and on all gross rates a discount of 25 cents is to be allowed if paid on or before the 20th day of the month in which service is rendered.

New Rates: All rates to be billed at the *net* rate, monthly in advance. Payment is due when bill for service is rendered.

The Woodstock company serves 99 local and 61 rural subscribers.

V V

Ohio Commission to Hear Plea On Private Answering Device

The Ohio Public Utilities Commission will hold a public hearing on Sept. 21 on the fight of Tom G. Murray of Washington Court House, to keep his automatic telephone answering device (TELEPHONY, July 17, p. 38).

Murray filed a complaint against the Ohio Bell Telephone Co. on Mar. 25 about the use of the device which he purchased himself.

The device figured in a Common Pleas Court case in which the judge decided it was up to the commission to determine whether Murray had to use a similar device furnished by the telephone company or one of his own.

V V

North Carolina Company Asks Commission for Rate Raise

Eastern Rowan Telephone Co., Inc., of Granite Quarry, asked the North Carolina Utilities Commission on July 27 for permission to increase its rates, stating that extra revenue is needed to offset rising expenses and to provide a better return on its investment.

The company, which has a dial central office at Crescent, and serves Granite Quarry, Faith, Rockwell and Gold Hill, said that it has approximately 1,500 subscribers in an area of approximately 38 miles and that it has borrowed $423,000 from the REA telephone fund since it began operations in 1949 by acquiring the Rowan Telephone Co. and anticipates borrowing $150,000 more. The new loan, it said, would be used to help provide service to approximately 700 waiting subscribers.

The company now charges business subscribers $7.50 for one-party service, $6.50 for two-party; $5.50 for four-party, and $4.50 for rural multi-party service. Its residence rates are $4.25 for one-party service, $3.25 for two-party; $3.25 for four-party, and $3.25 for rural multi-party.

Under the proposed increases business rates would be raised to $9.00, $7.50, $6.50 and $5.50, respectively. Residence rates would be increased to $4.80, $4.20, $3.60 and $3.60.

V V

South Dakota Commission Grants Schedule of Rate Changes

The South Dakota Public Utilities Commission on July 27 approved a schedule of new rates for the City of Brookings Municipal Telephone Dept., as follows:

One-party business	$6.50
Two-party business	5.50
One-party residence	4.00
Two-party residence	3.25
Four-party residence	2.50

V V

Central of N. C. Gets Go-Ahead On Sale of Debentures

The North Carolina Utilities Commission on July 30 authorized the Central Telephone Co. to sell $1,500,000 worth of convertible debentures to raise money for improving and expanding its facilities.

The company, which has its North Carolina headquarters at Mount Airy, was authorized to sell the debentures at an interest of not to exceed 4.5 per cent and not greater than 3.5 per cent discount to underwriters.

Central originally asked for authority to issue the debentures bearing 4.75 per cent interest, but the Commission in its order stated "it now develops the rate will be 4.5 per cent, and the discount to underwriters 3.5 per cent of the principal amount."

The Central application stated that proceeds from the sale will be used to supplement "internal sources" of funds for the 1954 construction program and to advance funds on a temporary basis to subsidiaries. The total construction program was estimated at $1,900,000.

Funds raised from the debentures sale will carry the construction program through May 1 of next year.

V V

General of Pennsylvania Permitted Rate Increase

The Pennsylvania Public Utility Commission authorized General Telephone Co. of Pennsylvania, Erie, a $1,093,000 a year rate increase, it was reported on July 31. The amount was 30 per cent less than the $1,548,000 the company asked for.

The increase will affect 125,300 subscribers in 13 counties.

North Carolina Commission Denies Company Rate Increase

A $69,169 annual rate increase requested by the Hickory Telephone Co. was formally denied by the North Carolina Utilities Commission on July 30, after the body had issued a similar order earlier in the week and then withdrawn it for corrections.

The corrections had no effect on the decision denying the increase and the commission stated that the company "has not justified any increase in its rates and charges," and that it already is earning a return of 6.5 per cent on its average investment.

Commission Chairman Stanley Winborne, author of the order, said that evidence brought out during a hearing in February provided "little or no justification for allowing an increase," but that the commission had had its accounting staff to double check all figures "for the purpose of determining to what extent the company incurred additional expenses which the commission had not considered."

He said the second check, made by the commission accounting chief, C. L. Choate, showed that the company already was earning 6.5 per cent under present rates.

The Hickory company contended its investment was higher than that calculated by Choate and that it should get credit for the fair value of its properties rather than the average net worth.

However, the commission said that the company had failed to set down clearly what it considers to be a fair value, although it had offered an estimate.

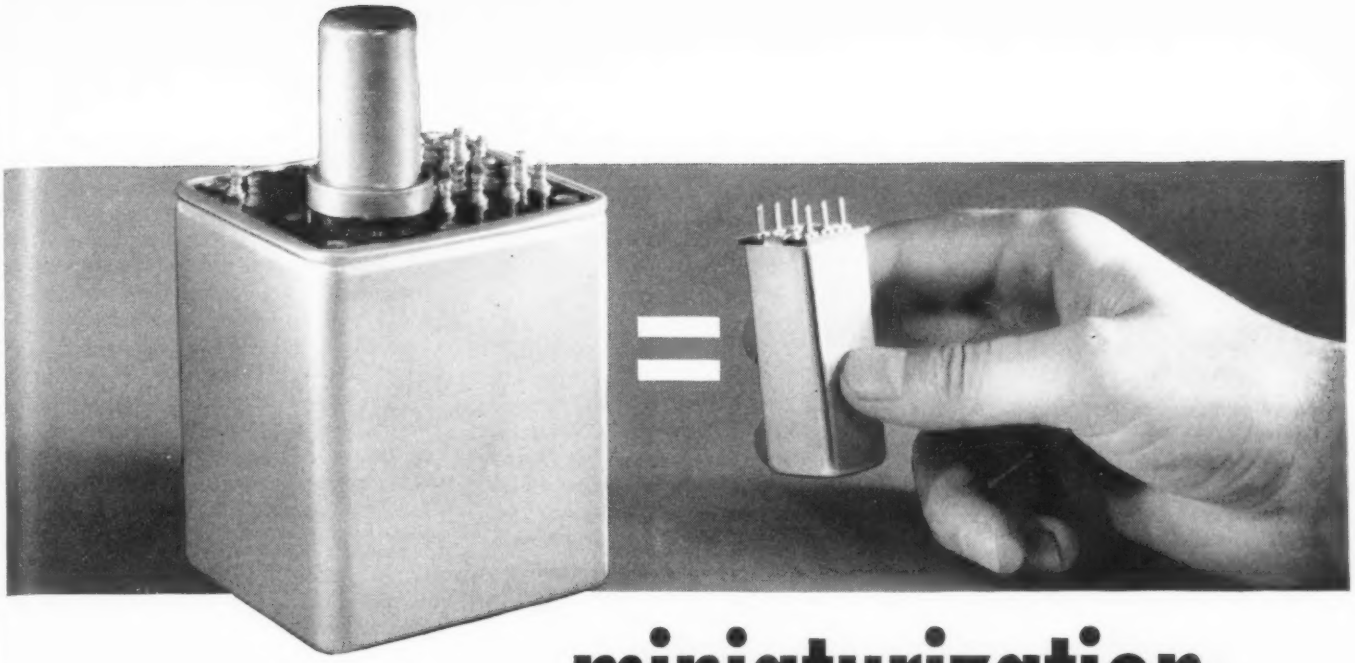
The commission's auditing staff set the company's average net investment for rate making purposes at $1,670,982.09, although Arthur H. Burgess, a Hickory certified public accountant, who appeared for the company, placed the plant value at $2,035,000.

The commission order said the evidence offered by Choate and its auditing staff was "based upon figures found in the record whereas the testimony of the witness Burgess is an estimate based upon expectations."

V V

Resigns from Colo. Commission

John H. Winchell, Denver attorney, resigned on July 23 as a member of the Colorado Public Utilities Commission, to become a member of the Federal Interstate Commerce Commission, Washington, D. C. He was appointed to this post by President Eisenhower.



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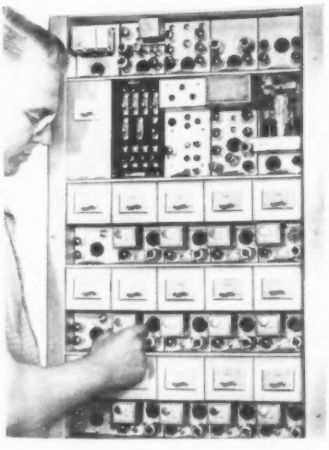

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SELLING TIME IS HERE AGAIN

Concluded from page 19

but don't you have something else?" The broker doesn't want to lose a sale, so, of course he says, "Sure, how about General Electric."

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Earnings are important in selling securities; but good earnings are of little value if potential investors don't know

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about them. And they won't be interested enough to inquire unless we first sell them on our company. Selling recognition is one of the most difficult jobs facing Independent telephone companies because of the size of the Bell System and the remarkable selling job which the Bell System has done. Ours is not an impossible job, but it will take work—real, vigorous work—and it will take money. As you know, the United States Independent Telephone Association has started a national advertising campaign which I believe will be helpful to our entire industry. This advertising will attract investors, will interest high school and college job applicants for our industry, will improve the morale of our own employes, all of whom like to be associated with a well-known business; it will give us added stature with the public and regulatory agencies. These considerations are obviously very valuable to us in the Independent telephone business.

Our ability to interpret our corporate action to the public must become the nucleus for our industry-wide public relations program. Some of our most astute citizens have the idea that public relations functions are to assist with sales. My convictions are that public relations is selling, and nothing more. If your public relations are bad, you will sell only as the customer is forced to buy from you; but let your public relations be sparkling, kindly, real and deep, and you will find your customer going out of his way to buy your product or your securities. It is my opinion that if you have a true understanding of your sales job, then you must know that public relations isn't just an added feature that will help you in your business. Public relations is your business if you are going to sell successfully.

Every time one of my people comes into my office to talk to me, he is either selling me an idea, or he is selling me on his ability to handle a problem. In turn, I sell him on my ability to lead and direct the activity of our company, not because I have to sell him, but because I want it that way. So, it seems to me that every action we take in business—or in connection with our business—we are selling in one form or another. How can we fail to emphasize the importance of sales when we know its value in a regulated as well as in a "competitive" business.

I believe if we sell our industry to the public we will facilitate the migration to our areas. I believe if we sell our industry to present and potential investors we shall be able to raise the money to expand our facilities and to meet the new demand for service. I believe we can sell more of our services to more people in our areas and — through sales — help to increase our earnings. I believe we can sell regulatory commissions on our need to reprice our product. I believe we can sell more and better qualified people to look to our companies for employment opportunities.

But, we must sell—and sell hard—if we are to accomplish these important gains for the Independent telephone industry.

[**EDITOR'S NOTE:** *Drawings accompanying this article are reprinted from "The Round-Up," employe magazine of the General Telephone Co. of the Southwest. Photo on page 17 courtesy of Ohio Bell Telephone Co.*]

V V

"I hate to see a thing done by halves; if it be right, do it boldly; if it be wrong, leave it undone."—GILPIN.

V V

"Enthusiasm is the height of man; it is the passing from the human to the divine."—EMERSON.

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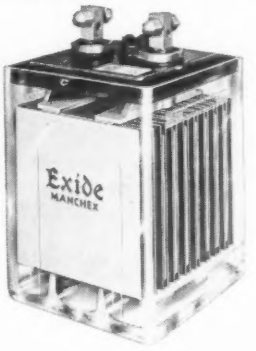

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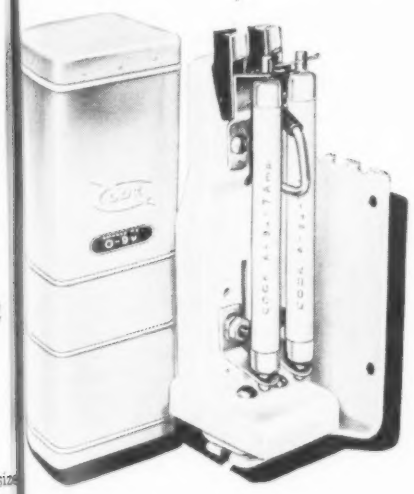

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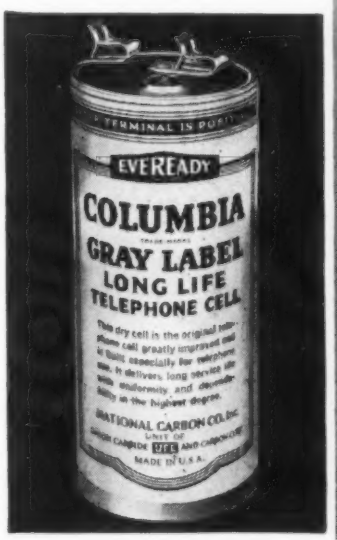

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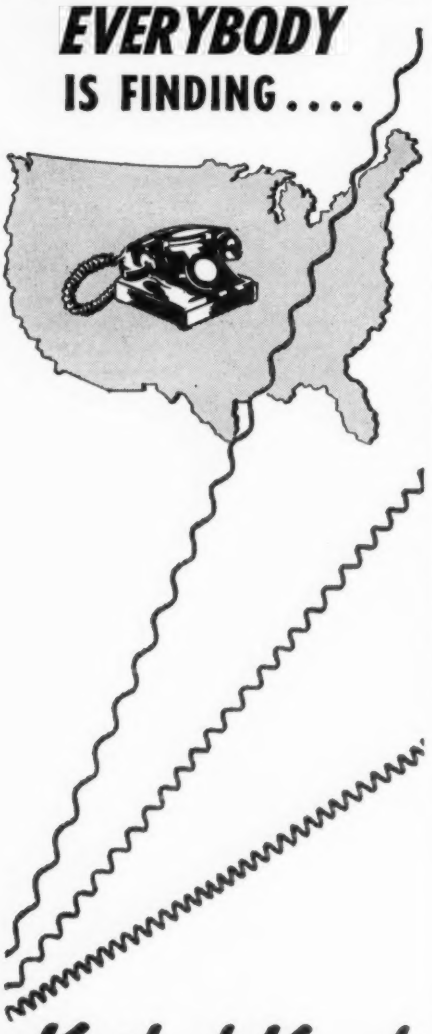

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IN THE NATION'S CAPITAL

Continued from page 21

us (the court) to adopt in pure form either the reproduction cost rule or the prudent investment rule, or, for that matter, any other fixed or definite standard." Each of the elements of value, the opinion asserted, must be given such weight as may be just and right in each case.

"If justice and reasonableness, or justice and right, are to guide us," the court said, "the sad truth is that we are led out of the relatively clear-cut realms of law, logic, and economic formula into the shadowy field of ethics."

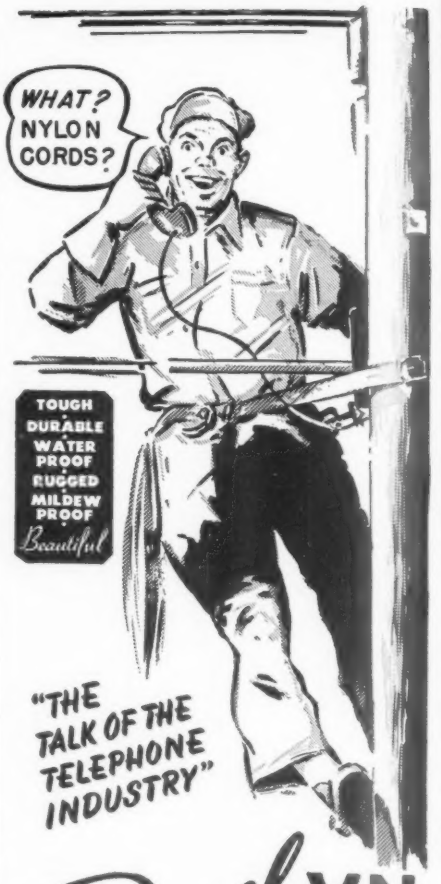
The high court pointed out that while Judge Layton had ruled that reproduction cost was entitled to "substantial" weight, what he actually did was to give it "exclusive" weight. The court's decision probably will result in somewhat lower rates for the Diamond State Telephone Co., in view of the higher rates allowed by the lower court on the basis of Judge Layton's decision. But how much lower the rates will be, will have to wait determination by the Delaware Public Service Commission. The high state court also found that the lower court had erred in making its own determination of needed working capital.

Commission Turns Down Extravagant Co-op Financing

The Kansas Corporation Commission has recently demonstrated its critical opinion of efforts of cooperatives to go into the telephone business on the basis of inadequate equity financing. It turned down the application of the Cimarron Valley Telephone Association, Inc. for a certificate to buy up telephone properties in Clark and Meade counties, Kansas, with REA loans amounting to some $415,000. Cimarron Valley is a newly-organized telephone cooperative without prior experience in the telephone business and virtually no assets of its own. Telephone exchanges it proposes to acquire at Ashland and Englewood would amount to 6 or 7 per cent of the net telephone plant owned and operated by Western Light & Telephone Co., Inc., an experienced public utility business in the state of Kansas.

The telephone company was disposed to sell the two properties in order to get the balance of its operations more closely knitted around its general office at Great Bend. But it had a continuing program for service improvements and was engaged in metallicizing rural lines on the exchanges proposed to be sold.

Because the cooperative has virtu-



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ally no assets, it would be required to make heavy borrowing, including the issuance of its note to the federal government in the amount of $400,000, plus incurring additional obligations to carry out an ambitious program of conversion to dial. The Kansas commission analyzed this program critically in the following passage from its opinion:

"The Cimarron Valley proposal is to virtually dismantle all the existing properties and construct an automatic dial system. The company estimated that by conversion to dial the gross plant valuation at the time of conversion would be $353,023.

"WL&T (Western Light & Telephone Co.) at the present time is serving 802 subscribers and the Cimarron Valley hopes to ultimately serve 852. To provide dial service to existing and 49 more subscribers it will be required to obtain $415,000 in REA loans. At the present time, of the 802 subscribers, 705 are in Ashland and 97 in Englewood. Cimarron Valley intends by this proposal to increase the plant investment by roughly four times the present net plant valuation. The investment under the proposal of Cimarron Valley then would roughly be $487 per each subscriber whereas currently the investment of WL&T per subscriber is approximately $150. . . .

"While we do not desire to engage in the realm of conjecture, we entertain grave doubts as to the feasibility and financial soundness of the proposal which Cimarron Valley has made in these proceedings. Without experience and by heavy borrowings, and through greatly increased investment for each subscriber, Cimarron Valley seeks to engage in the business of a telephone utility in this area with an obvious low density factor."

The opinion went on to say that before the commission could approve a change in ownership of a public utility it felt duty bound to find that the venture would be a success under the new ownership. The commission felt that it had to look first to the public interest, to the methods of financing, the experience of the new management, and other vital factors affecting public convenience and necessity. That would include, of course, consideration of what service would cost to the public, what the investment would be, etc.

No public witnesses from either of the communities involved appeared in support of the transaction. The commission accordingly reached the conclusion that public convenience and necessity would be best served by the commercial telephone company retaining the properties and continuing their operation.

As to the proposed conversion to dial, the commission added this precautionary note: ". . . it is entirely possible that the investment per cus-

(Please turn to page 40)

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The use of the fifteen inch Blackfoot permitted one anchor to take the place of several smaller ones. This added up to a considerable saving in material costs. Speedy machine installation—with fewer anchors to install—slashed installation time to a small fraction of what was previously required.

How did these anchors hold?

Company personnel conducted their own pull tests to determine the holding power of these Chance Anchors. The dynamometer showed *no* creep at 22,000 pounds!

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CARRIER SYSTEMS

Concluded from page 25

modulation or demodulation equipment, unless a channel is dropped off at the repeater point. In such a case, terminal equipment is used only for the channels which are to be used at the repeater point.

The reason a repeater is used is because of loss of signal strength over long lines. The wires in a line have a certain amount of capacity between them, and are in effect a long drawn out condenser. As was shown in the chapter on condenser action, an applied voltage cannot get past a condenser until the latter is charged.

On a long telephone line, the process of charging uses up much of the applied signal strength and very little may get to the other end. In a manner of thinking, it might be said that this is because the telephone currents are alternating, and the current reverses before the line fully charges. In cable circuits, loading coils are used to offset the effect of cable capacitance. These coils are placed in series with the cable pairs, and as explained in our discussion of coils, cause an opposite effect to that of a condenser. Thus, voice frequency cable lines may be extended to greater lengths without amplification.

With carrier, the high frequencies used are even more quickly absorbed by the line capacitance, and die out rapidly. Further, the use of regular loading coils is prohibited because the inductance of these coils choke off or retard carrier frequencies.

Therefore, additional amplifiers, or repeaters as they are called must be placed at intermediate points along the line, to restore the carrier frequencies to proper strength. In general, the higher the frequencies used, the closer together must be the repeater amplifiers. Also, in systems operating over cable, which has greater capacitance than open wire line, more repeaters will be required.

Repeaters, like other vacuum tube devices, are one-way circuits, so two are required at each point, one to amplify in each direction.

East Is North

When Kipling wrote "The Ballad of East and West" he wasn't thinking of carrier directional designations, which sometimes bear little or no resemblance to the geographical directions involved.

Because carrier equipment is one-way apparatus, it is necessary to designate at terminal and repeater points, just what direction the apparatus is transmitting or receiving.

Originally, perhaps, the designations conformed with the actual geographical direction taken by the line, and terminals and patch bays were so marked. However, the actual direction was not so important as was the concept as to which piece of apparatus was incoming and which outgoing.

This information was necessary at patch bays, where substitute circuits might be plugged into service in times of failure. Gradually it has become understood among telephone people that west and south are synonymous, and east and north are synonymous. From the beginning, it became important to put both directional designations on the cards adjacent to jacks for interconnecting circuits. Soon these were abbreviated, and only east and west appeared. Started as a space-saving expedient, the east and west designation is now virtually standard, and north and south are used rarely.

A complication which arises in connection with directional designations is the fact that an exchange may be the north terminal to one town and the south terminal to another. There is an agreement between users of carrier equipment, which allots the frequencies which will be used for transmission in different directions. Now, if the toll leads from the exchange run parallel for a few miles, say to the east, before branching to the towns to the north and south, the company may find it has violated the frequency agreement in the section of line that runs to the east. This would be because the exchange is both a north and south terminal.

This situation exists in some parts of the United States where routes to large cities run parallel. In order to preserve the frequency allocations in these cases it has been necessary to place designations which were contrary to the actual geography. There are places where circuits designated "northbound" actually provide service to the south.

Literature concerning manufactured carrier equipment today usually uses only the terms "east" and "west" in the circuit descriptions, but the other two directions are implied.

(To Be Continued)

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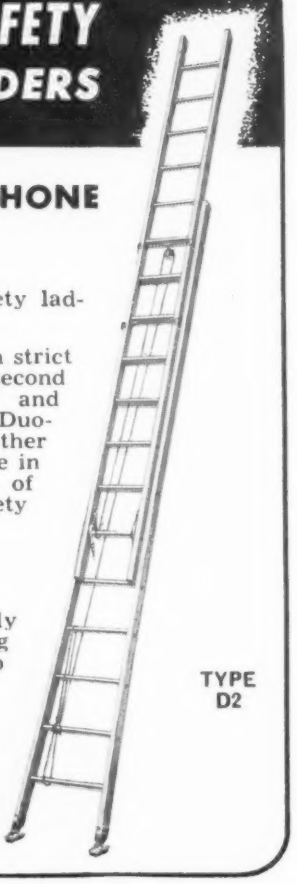

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V V

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AT&T—SIGNAL CORPS

Concluded from page 28

rected the Secretary of War to construct telegraph and cable lines connecting military headquarters in Alaska. The law further provided that commercial business would be handled over these military lines.

In accordance with this congressional mandate, the Washington-Alaska Military Cable & Telegraph System was organized under the jurisdiction of the Chief Signal Officer, and the first telegraph line was completed on Sept. 15, 1900, connecting Nome and Port Safety, a distance of 24 miles.

In May 1936 the name of the system was changed to the Alaska Communication System.

Today the ACS provides long lines communications throughout Alaska and between the territory and the United States. The system comprises some 45 separate stations which furnish direct telephone and telegraph service to all major cities in Alaska and to all military installations situated there. The system of land-lines, submarine cables and radio facilities connects at various points, dependent on seasonal needs, with over 300 government and privately owned radio and telephone stations in the smaller towns and at canneries scattered throughout the nearly 600,000 square miles of territory.

V V

Stockholders in Ohio Company Vote Sale to Lima T&T

Stockholders of the Elida (O.) Mutual Telephone Co. voted on July 14 to sell the company to the Lima Telephone & Telegraph Co. Details of the sale were not yet worked out when the transaction was announced.

About 400 of the 600 stockholders voted "yes" on the issue. A previous vote had favored sale of the Rimer exchange of the Elida firm to the Columbus Grove Telephone Co.

V V

Bill Requiring Telephones on Great Lakes Ships, to House

A bill providing for enforcement of a United States agreement with Canada which requires that Great Lakes vessels be equipped with radio-telephone, passed the Senate on July 10 and went to the House. The bill provides for a fine of $100 against the captain of ship not so equipped, and would levy a fine of $500 a day against any foreign vessel violating the agreement.

The original agreement was ratified by the Senate on July 4, 1952, and becomes effective on Nov. 13, 1954.

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No. 41 Push Drill ("100 PLUS") all-metal, highly finished. Magazine handle holds eight drills, from 1/16" to 11/64".

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IN THE NATION'S CAPITAL

Concluded from page 37

tomer and the charges therefore will be prohibitive and in some instances a burden to the individual telephone user."

New Appointments

The appointment of a 43-member Transportation and Communications Committee was announced by the U. S. Chamber of Commerce at Washington, D. C., headquarters on July 26. The committee will serve during the 1954-55 period. It is composed of five chief executives each of rail, highway, water and air carriers; 11 shippers; three communications (telephone and telegraph) officials and others from pipeline, freight forwarding, warehousing, and urban transit fields.

Chairman of the committee is Arthur E. Stoddard, president of Union Pacific Railroad Co. The three communications industry men are: Carl D. Brorein of Tampa, Fla., president of the Peninsular Telephone Co.; T. B. Gittings, vice president of Western Union Telegraph Co.; and E. H. Wasson, vice president of the American Telephone & Telegraph Co.

The transit industry's representative is former American Transit Association President Harry W. Arnold, president of Ohio Rapid Transit, Inc. The pipelines are represented by J. L. Burke, president of Service Pipe Line Co., Tulsa, Okla.

* * *

President Mervin J. Kelly of Bell Telephone Laboratories has been named to head a subcommittee on research activities of the Department of Defense within the Hoover Commission's Committee on Business Organization of the Defense Department.

V V

Three Indiana Independents Vote on Merger Proposal

Stockholders of the Harrison County Farmers Telephone Co., Crandall, Ind., and stockholders of the Mutual Telephone Co., also of Crandall, each held separate meetings recently and voted favorably on the merger of the three telephone companies at Crandall.

Stockholders of the third company, the Excelsior Telephone Co., were to have met subsequently to vote on the merger of the three.

V V

N. D. Mutual Incorporates

Articles of incorporation for the BEK Telephone Mutual Aid Corp., Steele, were filed recently with the North Dakota Secretary of State.

Lions Elect M. A. Kugler An International Director

Morris A. Kugler, manager of the Okaw Commercial Telephone Co., Okawville, Ill., recently was elected an international director of Lionism at

M. A. KUGLER

New York at the closing session of the big service club's 37th annual convention.

Mr. Kugler has been active in Lionism since 1930, being a charter member of the Okawville club.

He served in all offices of the local club, and has a record of 24 years of perfect attendance. He recently was awarded the "key of state" for procuring 75 new members for the club.

He served as district zone chairman, deputy district governor and district governor. He was selected by District 1 and the Illinois Lions as their candidate for international director.

The board of directors and presidents are the governing body of Lionism.

V V

Terre Haute, Ind., Company Aids In Providing Network TV

Station WTHI-TV, Terre Haute, Ind., received its first network television program over the July 24 weekend via the Bell System's nationwide communications facilities.

According to an announcement by American Telephone & Telegraph Co.'s Long Lines department, network programs reach WTHI-TV over the Pittsburgh-St. Louis radio-relay route, which passes through Terre Haute.

Local interconnection in Terre Haute was provided by the Citizens Independent Telephone Co.

V V

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Specifications are helpful guides in choosing the right hoist for your job. Factory tests give further assurance. But the hoists on your own job hold the key to your wisest final choice. These hoists have been tested in the world's best laboratory for your purposes. They have been operated by *your* men under *your own* exacting conditions. Their performance takes the guesswork out of choosing.

That's why Coffing Safety Pull Ratchet-Lever Hoists are standard with so many line maintenance and construction crews. Their record of durability and safety for more than 25 years under actual job conditions puts them in a class by themselves as the wise choice.

Examine the hoists in *your* "laboratory." Which is the oldest one in good working condition? When safety is vital, which hoist does your crew use? We believe the answer is Coffing — the *original* ratchet-lever hoist. If you would like more information on the complete line of Coffing Ratchet-Lever hoists, write for catalog T8SP.

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A highly efficient noise-cancelling carbon microphone, the CONFIDENCER serves a double purpose. It affords clearer speech transmission and at the same time neutralizes the gobbledygook of unwanted noises. It has excellent anti-feedback characteristics, and its performance makes it desirable wherever speech-garbling noises exist, and especially in factories, workshops, outdoors.

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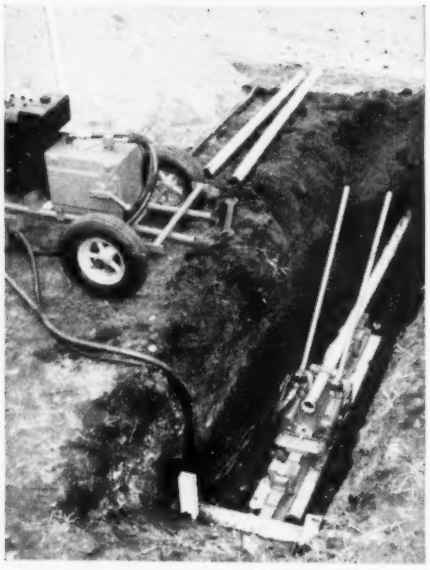

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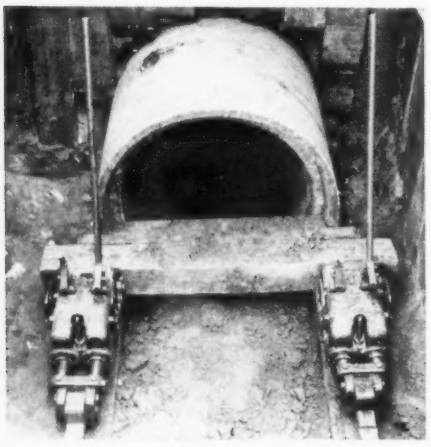

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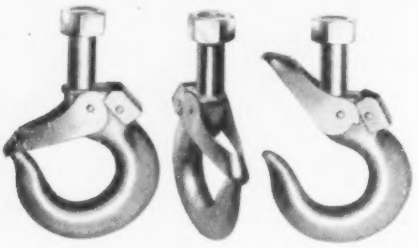
news on new PRODUCTS

HOIST SAFETY HOOK—Many advantages are claimed for a new safety hook that has been developed by Coffing Hoist Co. It is said to not only offer greater safety to both men and equipment during lifting operations, but is



also simple and convenient enough so that hoist operators will make full use of its safety locking feature.

Once the hook is engaged, a stamped steel latch swings down and is securely held in place by a lock that is under spring tension. There can be no movement of the latch sideways because it fits snugly over the point of the hook. Slight pressure on the release unlocks the latch, and spring tension on the release holds the latch open.

The latch is designed to allow full and unobstructed use of the hook's large throat opening. It is also designed so that it will shed wires and other objects rather than snagging them.

The hook itself is made of drop-forged, heat-treated alloy steel, and is claimed to have higher tensile strength than any other hook of its size on the market. Cadmium plating prevents any rusting or corrosion that might otherwise hinder its use.

This new safety hook is optional (at slight extra cost) on new Coffing hoists, and also can be placed on Coffing hoists now in service. Request NP 290.

• • •

ELECTRIC HOISTS — Cable Quik-Lift electric hoists are also available from Coffing Hoist Co. The new units

range in capacity from 500 to 4,000 pounds with a choice of lifting speeds and types of suspension. These cable hoists answer the need for a fast, flexible unit on many industrial applications.

Like the coil-chain Coffing Quik-Lift electric hoists, the new units are designed for heavy production-line work, according to the company. In addition

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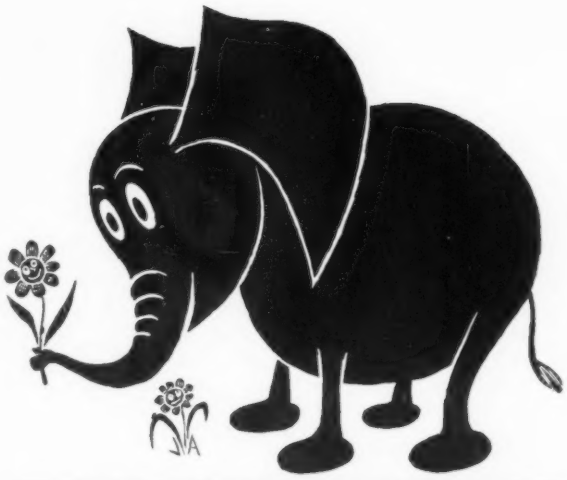

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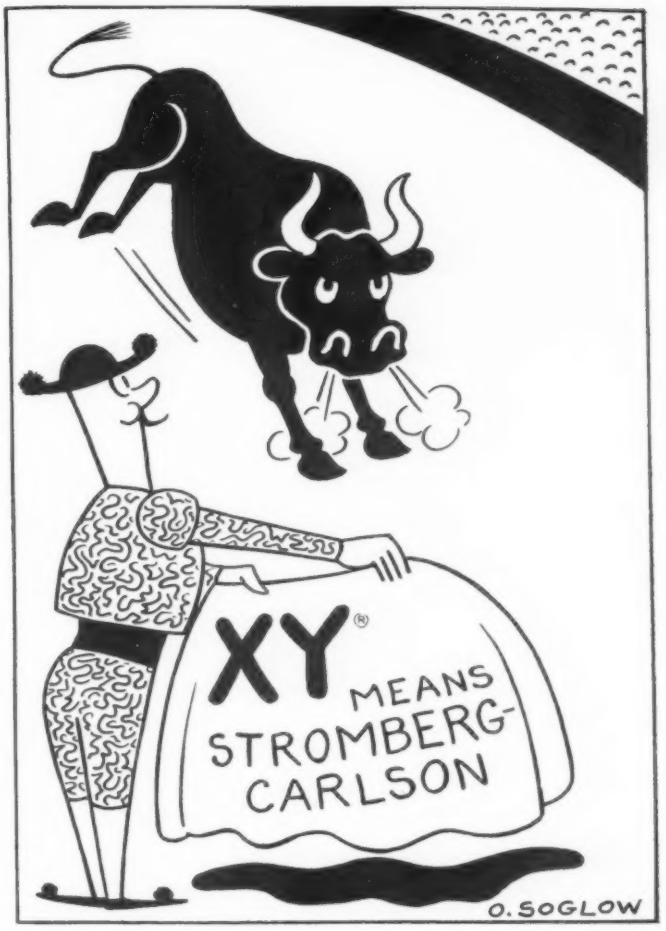

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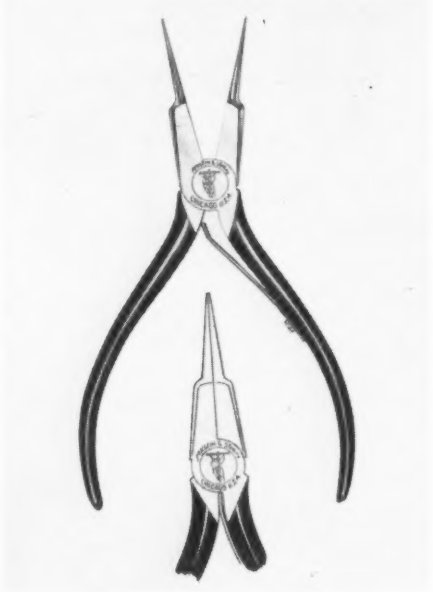
to stressing strength and long life, the new hoists provide push-button control; large, separate load and motor brakes; foolproof limit switch and many other features designed to assure the greatest possible safety for both men and equipment, a company spokesman said. The new Coffing safety hooks, described above, also provide extra protection. Request NP 291.

• • •

NEEDLE-NOSE PLIER — Mathias Klein & Sons now offers a special needle-nose plier for precision work and delicate wiring of all kinds.

The plier is designed with an extra-



long needle nose, severely tapered to a point less than 1/16-inch. A replaceable tempered steel spring keeps the plier in open position, ready for immediate use. The plier is forged from high-grade tool steel, individually fitted, tempered, adjusted and tested. Over-all length is approximately $6\frac{3}{4}$ inches.

Refer to No. 301-6-SCP-L for plier with leaf spring, and No. 301-6-SCP for plier without leaf spring. For pliers with cutters on shoulder, refer to 203-6-SCP-L (leaf spring), 203-6-SCP (without leaf spring. Request NP 292.

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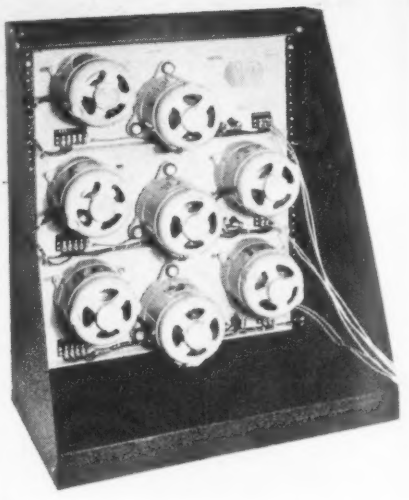
MOTOR GENERATOR SET — National Pneumatic Co., Inc., and Holtzer-Cabot Divisions announce the introduction of a new five-frequency motor-generator set capable of generating harmonic, synchromonic or decimonic series of frequencies, with an output of 15 watts for each of the basic frequencies.

The generators used are of the permanent type and cannot be demagnetized by short-circuits or disassembly. No insulating transformers are required.



The unit is cog-belt driven by synchronous ac motors and governor-controlled dc motors to ensure precise frequency regulation.

The panel is furnished completely assembled and drilled for mounting on standard 19-inch relay racks and may be furnished for other size racks. Each set can be supplied with a dial tone generator and interruptors if required.

This unit was designed to meet the requirements of rural telephone companies. Request NP 293.

• • •

CABLE TESTER—Murphy Engineering Laboratory has announced a new cable tester—Model C, according to Freland M. Murphy, president.

The development of the Murphy cable tester resulted from a problem encountered by Mr. Murphy while designing and installing a sound and intercommunications system for his church. In order to test out the circuits in the system, Mr. Murphy, who is an experienced telephone switchman, designed a one-man test set.

Mr. Murphy perfected the tester—

PHOTOGRAPH BY RICHARD BEATTIE

What are the facts about cancer of the lung—?

JUST 20 YEARS AGO, in 1933, cancer of the lung killed 2,252 American men. Last year, it killed some 18,500.

WHY THIS STARTLING INCREASE? Our researchers are finding the answers as rapidly as funds and facilities permit—but there isn't enough money.

DOCTORS ESTIMATE that 50% of all men who develop lung cancer could be cured if treated in time. But we are actually saving only 5% . . . just one-tenth as many as we should.

WHY—? Many reasons. But one of the most important is not enough money . . . for mobile X-ray units, for diagnosis and treatment facilities, for training technicians and physicians.

THESE ARE JUST A FEW of the reasons why *you* should contribute generously to the American Cancer Society. Won't you please do it now? *Your* donation is needed—and urgently needed—for the fight against cancer is *everybody's* fight.

Cancer
MAN'S CRUELEST ENEMY
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GENTLEMEN:
☐ Please send me free information on cancer.
☐ Enclosed is my contribution of $..... to the cancer crusade.
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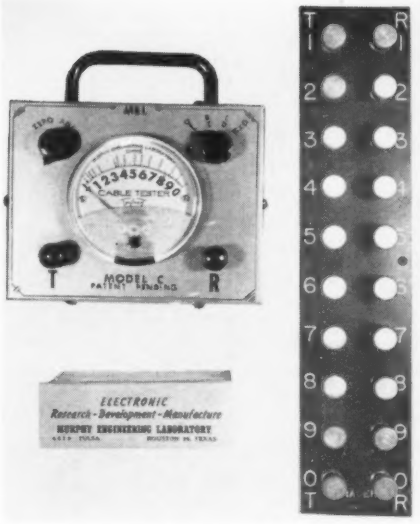
Simply address the envelope: CANCER c/o Postmaster, Name of Your Town



known as Model A—and placed it on the market. Model C includes many refinements and improvements over the first model.

The tester includes a terminal board (see photo) with a bridged resistor which is connected to the distant end of the cable in which pairs are to be identified and tagged. Then, the milliammeter is adjusted to read zero and to compensate for the resistance of the cable pair. When the circuit is closed over one pair, it reads 1, etc.

The terminal board is connected so that when the tip side of the pair is identified the meter reading indicates "tens" and the ringside "units." In this way, a 100-pair cable may be tagged by one man.

Mr. Murphy lists the following features of the Model C tester:

(1) It is really three test sets in one. A four-position rotary switch changes the set from the basic cable pair identifier to a buzzer continuity tester or to an ohmmeter as the rotary switch is thrown from one to another of the four clearly marked positions: Off, buzzer, identifier and ohmmeter.

(2) It is never necessary to change the test leads to the meter unit—just turn the switch to the kind of test set needed.

(3) The buzzer continuity tester is used to buzz out terminal tails and is also used by two splicers when "cutting in" a piece of cable, as well as for other continuity checks such as checking cross connections on distributing frames or in FX boxes.

(4) The ohmmeter is used to find the approximate location of a short, ground, or a cross that has been encountered while making other tests. The scale is especially adapted to the range most needed in cable work, with 500 ohms near the center of the scale. When using the ohmmeter, the meter must be adjusted to zero ohms while the switch is thrown to the position marked OM (Ohmmeter) and the two test leads are shorted together. Then the two leads are connected across the circuit to be measured.

(5) The pair identifier is used to

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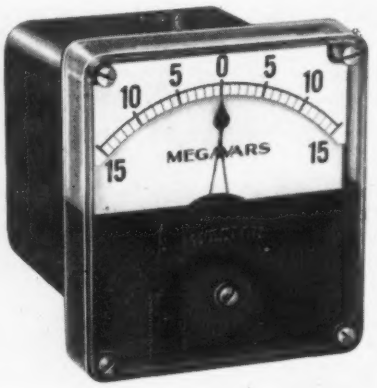
identify the individual pairs in a cable as well as to pick up defects such as shorts, grounds, crosses and opens that may be present.

(6) The "off" position of the switch is used to reduce the possibility of running the batteries down in the event the test leads are left connected and get shorted together during storage of the set. Request NP 294.

• • •

PANEL INSTRUMENTS—A new line of 4½ inch switchboard and panel instruments with clear plastic fronts and "in-line" pointers and dials, has just been announced by the Weston Electrical Instrument Corp.

Known as the Model 610 Group, the plastic fronts admit a maximum amount



of light on the dial from the sides, top and front, and thus eliminate need for internal illumination under normal operating conditions. The "in-line" pointer and dial in which the scale is raised in plane with the pointer tip, eliminates parallax errors and permits accurate readings at an angle. This combination of features provides excellent scale visibility and assures accurate readings quickly with shadows reduced to the absolute minimum.

While the lower portion of the plastic front is normally black, other colors can be provided where color coding is required. All instruments also can be furnished with black Bakelite fronts, with or without in-line pointers and scales. At slight additional cost internal illumination can be furnished on the Bakelite front instruments with flat dials.

The Model 610 Group is available in types and ranges to meet all switchboard and special requirements. Scales are 3.5 inches in length; rated accuracy 1 per cent of full scale value; size 4 inches x 4½ inches. Request NP 295.

• • •

TRUCK OVER-DRIVE UNIT — A new, factory-installed over-drive attachment of latest design for five International light-duty truck models has been placed in production. it has been an-

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Other Sizes in stock

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nounced by International Harvester Co.

The over-drive attachment is available optionally in models in the International R-100 and R-110 series, and is designed to effect operating economy; smoother, more comfortable driving; and longer engine life.

The over-drive gear ratio is 0.7 to 1, reducing the engine speed by approximately 30 per cent in the cruising range, and cutting fuel consumption. Engine life is lengthened, and at the same time maintenance requirements are reduced. Cruising speeds are held with less engine noise.

In operation, the overdrive gear can be cut in at any road speed in excess of about 30 miles per hour. Up-shift from third speed direct drive to over-drive is actuated by a split-second let-up of pressure on the accelerator pedal. The downshift from over-drive to direct drive is entirely automatic when road speed falls to about 20 miles per hour. At higher speeds, however, the driver can down-shift by briefly pressing the accelerator down or by pulling out the lock-out control on the instrument panel. Request NP 296.

V V

Stromberg Representative in Washington, D. C., Relocates

George Sheets of the Stromberg-Carlson Co. recently announced the removal of his Washington, D. C., offices from 810—18th Street, N. W., to a new location at Suite 712, Cafritz Building, 1625 Eye Street, N. W., Washington 5, D. C.

Mr. Sheets represents Stromberg-Carlson at the capital as an engineering consultant on all electronic and communications contracts now held by the company.

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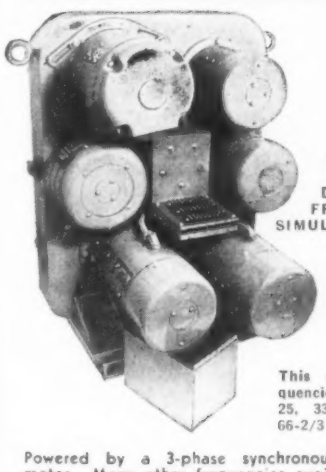

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This unit has frequencies of 16-2/3, 25, 33-1/3, 50 and 66-2/3 cycles.

Powered by a 3-phase synchronous speed AC motor. Many other frequencies available such as 20, 30, 42, 54, 66 cycles. Also single frequency units. Can be supplied with DC motors. Tone commutators. Coin collect generators.

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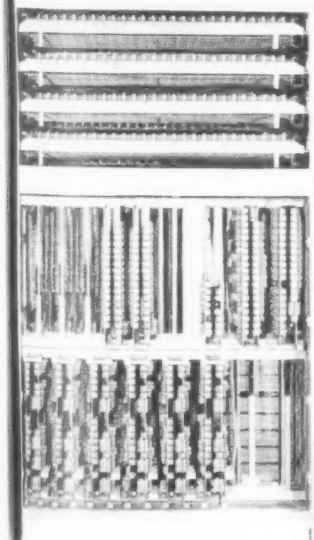

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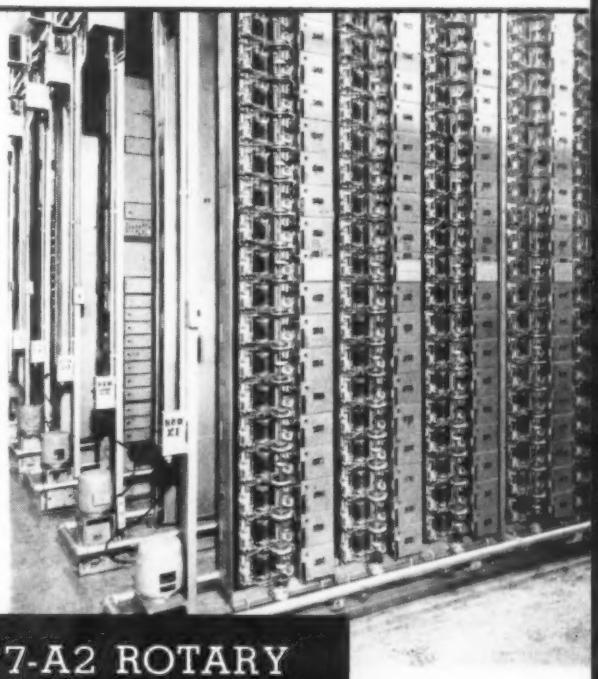

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